THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
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THE COMMERCIAL USES OF SILVER.

SOME INTERESTING FACTS CONCERNING THIS IMPORTANT METAL.

BY LAWRENCE IRWELL.

OCCURRENCE IN NATURE.

Silver is found native in many parts of the world and also in combination with oxygen and other elements in the form of ores, which form a complex and interesting variety, for, unlike many other metallic elements, it appears in a state of purity in several forms as well as combined with a wide variety of other elements. Thus, not only do we have silver as a pure metal in the form of laminated pieces, as foil, grain, masses and veins, but it also exists pure as a component part of gold, as the latter is also found native. Absolutely pure gold has never been discovered in nature, the purest invariably containing some silver, which averages from 2 to 45 per cent., the technical term "electrum" is given to the alloy of gold and silver when the latter amounts to one-fifth of the former.

In the ore state we find silver mixed with bromine to the extent of from 40 to 45 per cent. of the latter in some of the Mexican mines, which ore goes under the commercial name of bromargyrite"; also mixed with from 12 to 15 per cent. of sulphur in "silver-glance"; with chlorine in "kerite"; and with sulphur and arsenic in "proustite."

MECHANICAL PROPERTIES.

Silver is one of the most attractive of known metals, and from time immemorial it has been in great demand for all kinds of objects, both for use and decoration. Its beautiful, yet peculiar white color, makes it easily distinguishable, and with but few exceptions, and those among the rare metals only, silver stands unequalled in many of its characteristics. Its melting point is comparatively low, and although it is much softer than copper, it is harder than gold. Its many peculiarities make it one of the most useful metals which the mines of our planet has provided for the enterprise of man.

Silver is very resonant in small quantity, but not in bulk; thus we appreciate the peculiar clear mellowness and delicacy of tone in silver bells, the silver flute or cornet, but if a mass of silver is struck—such as a thick rod or "pig," or a cast bar or ingot of bullion—then the sound is dull and heavy, totally unlike that which the same bullion will give when rung in the form of a coin.

Next to gold, silver is the most malleable and ductile metal known; so ductile is it that it may be drawn into wire strands twenty times finer than the finest human hair, if pulled through a perforated diamond, and when shaped into the form of plates it can be made very thin. The thinnest perfect unbroken plate known to have been beaten is only a one hundred and thirty-seven thousandth part of an inch in thickness, or so thin that a hundred and thirty-seven thousand sheets of the metal superimposed are required to measure the height of one inch. Considering the remarkable malleability and ductility, its extreme beauty and low price as compared with the rarer precious metal, gold, it is not surprising that silver has always been a popular metal with which to make objects of art, utility and ornament. As almost everybody knows, it is capable of receiving a brilliant polish. The ancient Chinese and the later Egyptians, Greeks and Romans made ornaments and utensils of silver, and used polished silver sheets as mirrors. The metal in its pure state, however, is so soft that objects made from it would not retain their shape for any length of time, and on that account it is usually alloyed with copper. The percentage of this alloy has varied at different periods in the world's history, and the collecting of silver spoons, dishes, etc., made at various times, and bearing the various assay and other marks, is still a popular fashion in England among rich people.

The introduction of electricity has made it possible to deposit silver on other metals, which in many cases have previously been electro-coated with copper, to the surface of which the silver adheres with great tenacity, if thinly plated, but if the object is allowed to remain in the bath till the deposit of silver is thick, there is then a tendency for the silver to crack and come off with rough usage, or the knocking of one object against another, as is inevitable in the case of spoons and forks.

ELECTRICAL AND THERMAL PROPERTIES.

Silver is the best known conductor of electricity and heat, which property alone brings it into great demand for all forms and varities of electrical work, either in its metallic or liquid state, or in the form of electroplating, which ensures better and more reliable contacts, alone or alloyed with copper, platinum, etc. With regard for its capacity for conducting heat, this alone enables it to be of great service in many ways, of which only the most important, and perhaps to most people the least known need be mentioned. The pyrometer is an instrument by which degrees of heat are measured, and it is made of many materials and designs, some of the most recent being based upon the ratio of expansion of gases, the power of certain bodies for electrification, the shrinkage of some forms of clay, or the expansion of metals. In the last case silver is especially useful. Alone, it never oxidizes at any degree of temperature. When strongly heated in open crucibles in air, even to far beyond its melting point,

it absorbs oxygen in very large quantities compared with its bulk, but the moment it begins to solidify, at that same moment it begins to part with its absorbed oxygen and becomes as before.

Moreover, the ratio of expansion at different temstant ratio to the degree of heat applied, and by the lengthening of the column of silver, the degree of temperature, up to certain limits, can be ascertained with considerable accuracy. It must, however, be understood that beyond 1000 degs. Fahr. the melting point

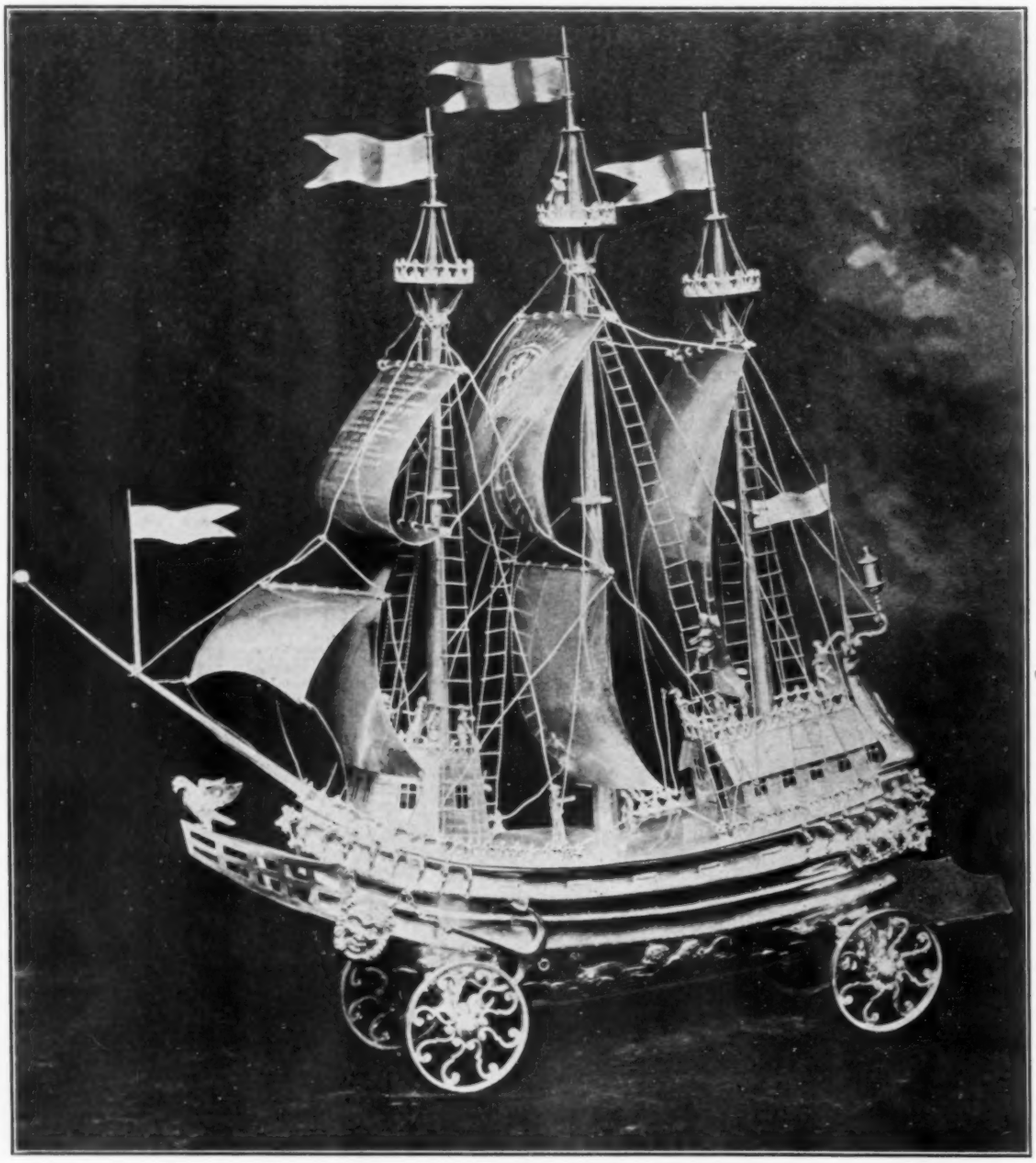


Photo by courtesy of New York Times.

SILVER SHIP GIVEN BY ROYAL SCOTTISH GEOGRAPHICAL SOCIETY TO COMMANDER PEARY.

This trophy, presented to arctic explorer R. E. Peary in Edinburgh, Scotland, is a beautiful example of the silversmith's art. It is designed as a modern example of the decorative objects in vogue in the Elizabethan period. It was made by Brook & Son, of Edinburgh, is of solid silver, and weighs over 100 ounces. It stands about two feet high, and is mounted on four wheels. It is a copy of a three-masted vessel in full sail, such as was in use in the latter part of the sixteenth century. On one of the sails is engraved the badge of the Royal Scottish Geographical Society, while another bears an inscription in Latin, from the pen of W. B. Blaikie, a translation of which is:

This representation of a ship such as was used by John Davis, Henry Hudson and William Baffin, illustrious arctic navigators of the olden time, has been presented by the Royal Scottish Geographical Society in token of congratulation, admiration and recognition to Robert Edwin Peary, American citizen, an explorer of the frozen arctic, not less daring than his daring predecessors, who was the first to attain to that thrice noble goal so long sought by innumerable bold mariners, the North Pole.

peratures is constant and well known, and, therefore, one of the most reliable pyrometers on the market has pure metallic silver as its active agent. This instrument owes its effectiveness to the expansion of a bar or rod of silver, which expansion takes place in a con-

of any metal is merely relative, and, therefore, any stated temperature beyond that can only be regarded as approximate.

Silver by its power of definite expansion under the influence of heat is used in an ingenious manner for

the automatic lighting of lamps and regulation of signals. In the former, a by-pass is attached to a thin wire of silver along which a slight electric current is sent, controlled by a switch which may be miles away. The warmth expands the wire, and automatically the by-pass is turned on. The added heat of the full light then keeps the wire extended, but when the pressure of gas is turned at the main, the reduced heat allows the wire to contract and the by-pass is thus drawn back, so that later, though the full pressure of gas may be in the pipes, the gas is not lighted till the switch is moved and the current sent along the wire. In the latter form (automatic signals) it is necessary for the man in charge of a number of lights, probably some miles distant, to know whether his lights are all burning correctly, so a second wire is placed at the top of the lamp and connected through a free-jointed switch or terminal on the lamp by ordinary electric wire to an indicator at the place of control. So long as there is no light it is inactive, but the instant the gas is lighted the heat expands the wire and completes an electric circuit, which lifts up a disc on an indicator board. The man in charge can, therefore, have hundreds of lights at great distances apart and possibly all out of sight under his perfect and immediate control. The dropping of a red or white disc or the absence of one, as the case may be, accompanied by the tinkle of a bell, shows at once the exact position and number of a faulty light, and a telephone message to its nearest repairing station results in its being put right within a very short time of the fault having occurred.

CHEMICAL REACTIONS OF SILVER.

Silver is used in the manufacture of percussion-caps, detonators, etc., as a fulminate. Fulminating silver is made by heating nitrate of silver with nitric acid and alcohol. This forms small, bitter poisonous, white acicular (needle-shaped) crystals, which are the fulminate. These crystals are very dangerous, for they explode with great violence often on the mere touch by a glass rod under water. They are used in the manufacture of bombs. Needless to say, these fulminates should only be made by experts and under suitable conditions. Their manufacture by inexperienced persons, even on a small scale, may endanger both life and property.

Silver dissolves readily in cold nitric acid, and less readily in cold sulphuric acid, although it will dissolve easily if the latter is warm or hot. At this point it may not be out of place to draw the attention of persons who have the care of silver to the mistake of using weak solutions of sulphuric acid ("vitriol"), as many do, because it removes tarnish readily. As this and nitric acid are solvents of silver, the tarnish is removed at the expense of the metal, a little of which is dissolved at each application, bringing off the tarnish with it, the cup or other article becoming thinner at each application. Remarkable as it may appear, many persons employed in silversmith's stores do not seem to realize this. As silver is not attacked by caustic alkalies, a safer and more scientific method would be to use ammonia, which would rapidly remove the black stains, and would do no injury.

Although silver is entirely unaffected by air, it has a very remarkable affinity for sulphur. For example, if a piece of rubber is kept in the same pocket with a silver coin, or other article, the surface will be blackened by the sulphur present in the rubber, which is also responsible for the black ring which rubber bands make when placed around silver objects. As ammonia absorbs hydrogen sulphide, it readily cleans silver without injury. Chlorine, however, has a distinct action on silver, and both common salt dissolved in water (chloride of sodium) and hydrochloric acid decompose the surface of the metal and convert it into chloride of silver.

Not only is metallic silver of inestimable value as a commercial product, but its salts and other compounds are of equal service. Up to now, only three combinations of silver with oxygen are known; these appear in the peroxide (Ag_2O_2), the suboxide or tetroxide (Ag_4O), and in the protoxide, commonly called oxide of silver Ag_2O. The various salts of silver (chloride of silver and others) are numerous, and are of great value, and have the peculiar property of darkening under the influence of light, which, it will be recalled, led to the invention of photography, in which art silver and its compounds still play a very prominent part.

A well-known compound of silver appears in nitrate of silver, which is in two forms—the crystallized and the fused. The crystallized form is interesting, because, though it is blackened by light, and by contact with all organic substances, should the solution be distilled water, light does not affect it in any way, so long as no organic matter is present, but the instant the least trace of organic matter is admitted, light commences to darken it, and the mere lifting of the glass stopper of the bottle containing it—on and off quickly—is usually quite sufficient to admit the organic matter necessary to commence its changes of color.

The second form of nitrate appears in the fused nitrate of silver, better known as lunar caustic, the uses of which, and its cauterizing action on animal tissue, are too well known to need more than passing mention. The nitrate and chloride of silver, as well as other salts, are used in medicine, and very largely in photography.

APPLICATIONS.

Silver is adopted in many countries as one of the metals from which coins are made, the standard varying according to the law of the particular country concerned. The standard of the United States and also that of France is 10 per cent. of tin and copper to 90 per cent. of pure silver. The standard for the English silver coinage, "hall-marked," silver goods and similar things is 92.50 of silver and 7.50 per cent. of copper. The difference in quality and market value of coins naturally influences the rate of equivalent exchange of silver of one country to that of another. The rate of exchange between countries in which gold is the standard and silver-standard countries, chiefly in South America, is, of course, affected by other matters unconnected with the purity of the silver coinage.

In the days of our grandfathers, mirrors were made of silver beaten into a thin sheet, the surface being levelled and polished. This sheet was then fastened tightly against a piece of glass and the edges well sealed to prevent ingress of air, the whole being backed and framed, forming perfect mirrors. A much simpler and cheaper process is new employed—that of coating the glass with a mixture of tin-foil and mercury, containing no silver at all, and, for the higher grades, precipitation on the surface of the glass of the pure metal from a solution of silver, each of which processes is usually followed by a backing for protection.

THE SCLEROSCOPE*

A Description of an Instrument For Determining the Hardness of Metals and Directions For Its Use.

By A. F. Shore.†

The scleroscope as an American invention is pretty well known historically, and it is now in such universal and successful use in all parts of the world, that I shall limit this paper to a discussion of the instrument as a scientific and commercial proposition.

WHAT IS HARDNESS?

To put before you an instrument having a mechanism based on certain well-known principles, or which is designed to execute one of the several methods of testing hardness, will obviously invite a number of questions. One of these is: What kind of hardness does each one of these devices measure? for it has been recently claimed that there are several different kinds of hardness. It has also been suggested that no one method will actually measure the several kinds of hardnesses, and an older theory has it that hardness cannot be measured at all.

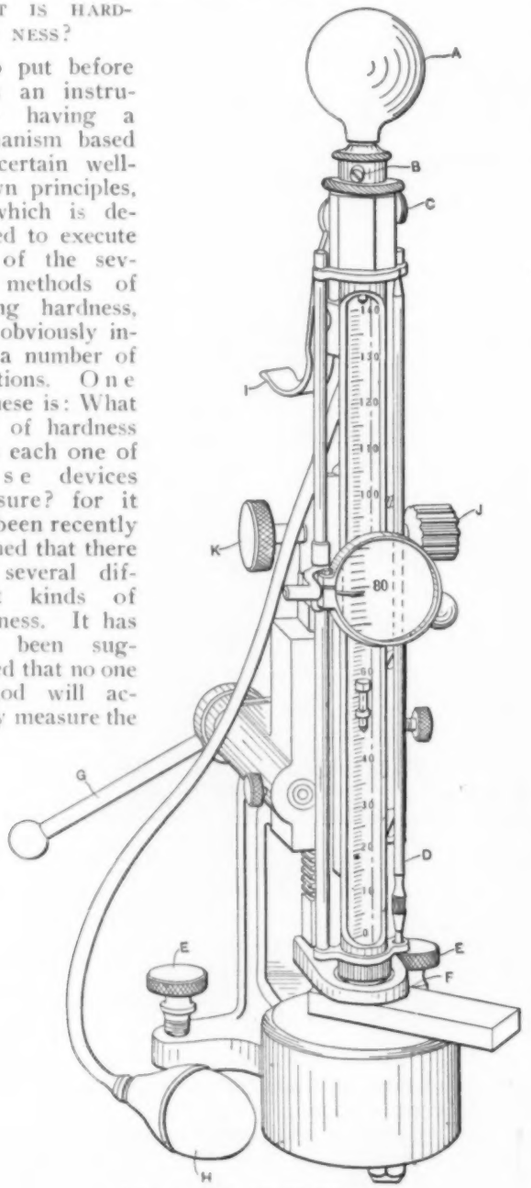


FIG. 1. THE SCLEROSCOPE.

The world is, however, progressing constantly, and we now do not only know that hardness can be measured to the satisfaction of practical engineers and manufacturers, but we are beginning to understand some of the laws in metallurgy on which an explanation of the complex property in question depends. On this point I wish to lay special stress, inasmuch as it would be futile to attempt a successful elucidation otherwise, and it is safe to say that a most extended controversy would lead to anything but conclusive scientific data such as must be our one object in view.

The sclerometer is perhaps the oldest device and method, and which seeks to measure hardness by scratching or cutting a polished surface of the test specimen, and probably, much of the credit due to this, belongs to Germany, although the brilliant work of Professor Turner of England in this connection is quite well known. He, with his improved cutting machine, admits that careful tests show that such a device while it agrees perfectly with the Brinell ball test and the Shore Scleroscope on metals in a certain condition, it does not recognize all the conditions which the latter two show out and agree on. On the other hand, some metallurgists have shown that metals in certain instances would seem to indicate that if one metal were really harder than another, the soft one would actually cut the harder one. When the drop and rebound principle was first introduced as a new method of testing hardness, I sought to settle disputes by using Foppl's method of comparing the hardness of one metal against another. This consists of crossing two little cylinders of each of the metals and forcing them together. I used non-ferrous metal castings and annealed steels and found that in every instance when the scleroscope showed these to be of a like hardness, the depression left by each metal by Foppl's method was also the same, or also if one metal showed a hardness twice as great by the scleroscope, then the harder would cut the softer, and this difference was faithfully confirmed by Foppl's method, who, by the way, is also a German. I regarded their agreements so perfect that I formally placed the scleroscope shown in Fig. 1 on the market in 1907, one year after its conception.

It is hardly possible to conceive of any kind of scientific instrument which may have met with greater success from the start, and after three years an incipient revolution in testing has easily been established, while yet some of those who use this instrument most successfully by the use of a little judgment, have been able to show me specimens of copper 20 hard, which could be indented and cut by brass half as hard by the scleroscope, and where the sclerometer or scratch method would show the same brass to be harder than the copper, or again an annealed steel 25 hard, would cut brass and even cold rolled steel nearly twice as hard, thus apparently completely upsetting my original claims. These peculiar conditions are generally known and many of those who are familiar with the scleroscope are much baffled. In fact, I should have to say there is as yet general confusion regarding these matters. An outgrowth of this condition has now developed a belief, that if steel shows the same hardness as brass, the steel is really much harder, but for some reason the scleroscope fails to differentiate—perhaps because the brass is more elastic. But then what about the ball test where no elasticity can enter and which gives similar readings.

EXPLANATION OF THE PARADOX.

My investigation of the discrepancies reported from time to time have shown that while these, like any of the

*From a paper read at Atlantic City meeting of American Society for Testing Materials, June 29, 1910.

†Shore Instrument Co., New York.

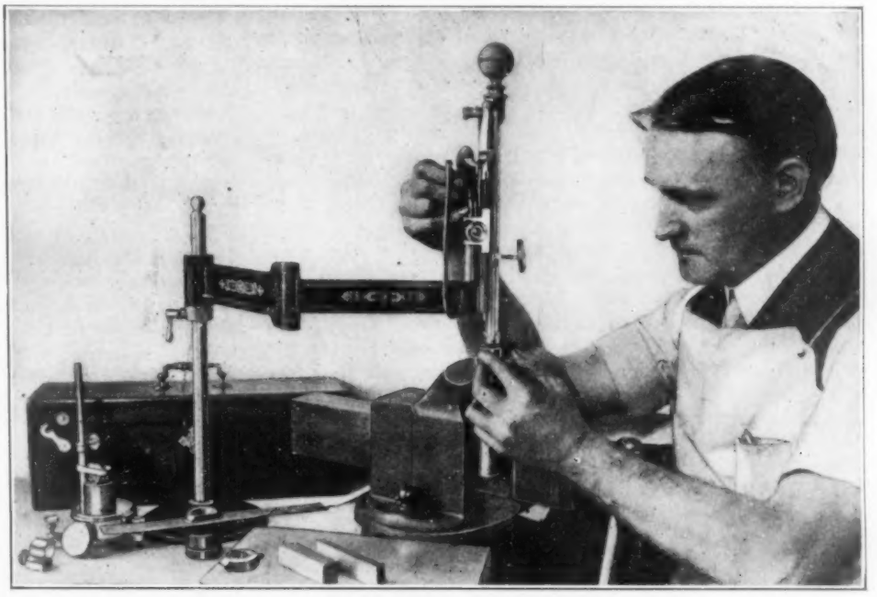
other metallurgical problems, do not readily lend themselves to an elucidation as the result of the labors of one man. I have been aided so much by sensible criticism that I believe the appended facts will show that my original claims still stand on bed rock, only the work had not yet then progressed far enough to predict the discovery of conditions now known.

Perhaps the greatest paradox which has seriously engaged the attention of some observers was in connection with cutting metals as dependent on one of the phases of hardness, or rather "cutting hardness," to use the simile of Professor Turner. Why did the brass which showed 12 hard by the scleroscope cut copper showing 20 hard. The answer is not original, but it is essentially due to certain conditions incident to cutting metals, as well as the condition the metals are in. If a chip is cut off any metal, particularly when the tool is blunt, a certain amount of pressure is required. This pressure must always exceed the ultimate strength, and therefore the chip is superhardened. Theoretically speaking, it would seem that if a metal were superhardened under pressure of any kind, the very term suggests another condition, and for which the term "basic hardness" would perhaps suffice. I may have said "annealed-hardness" but we must distinguish between castings which are not always considered to be annealed, and it is these that figure prominently in this discussion.

Suppose now, on the one hand, we were to select a piece of cold rolled or hammered copper which in the casting measured 6 hard, but as the result of pressure superhardened to 20 and on the other hand, we took a piece of brass 12 hard in the annealed condition or as a casting, and we then scraped the edge of one over the other to see which one will be cut. Now if we remember that there is a great deal of superhardening due to the brass casting as soon as it is exposed to compression, twice as much perhaps, as the limit of the copper, is it not clear that the piece of brass must easily cut the copper which was already compressed and could be superhardened no further, at least under the pressure required to do the said cutting? These things are exactly what happen in actual practice. The theory that steel showing the same hardness as brass by the scleroscope is really harder, when compared along these lines in conjunction with the greater toughness of steel, will obviously fall to the ground. The explanation hereby given of the seeming contradictions in regard to Foppl's comparison method and also the cutting comparison test, embraces facts which in my estimation constitute one of the laws which are essential, and which will have to be used as a pry to gain something like an insight into other phases of the hardening problem. Returning again to the influence of hardness in cutting, the following are facts:

That in metals whose hardness is strictly of chemical origin or basis the resistance to machining and the effect of the tool wear is dependent mainly on three properties, as abrasion, basic hardness and the amount of superhardening in addition due to the cutting pressures, and toughness; the latter however is usually greater, as the difference between the basic hardness and the superhardness due to cold compression is greater. In illustrating the meaning of this, copper in its natural chemical condition is about 6 hard, but after hammering cold, this will increase to over 20 hard, while cast iron 40 hard may show an increase of only 5 degs. in hardness, and hence it is not regarded as tough, and can be cut easily with a blunt tool such as would practically fail to cut deeper.

In metals having a basic or strictly chemical condition due to the casting or the heat treatment of wrought metals, the hardness gain curve is normally accompanied by an approximately proportional increase of abrasiveness or tool wear in a given metal, and which together cause a growing increase of resistance to cutting or machining. When these same metals are cold rolled, however, the resistance to machining increases with the hardness gained, but there is no noticeable increase of tool wear due to abrasion except for the higher cutting pressures now required, and which will utilize the original abrasive properties to more effectively wear the tool.



USING THE SCLEROSCOPE IN THE VISE.

THE SCLEROSCOPE.

Since the scleroscope has been so frequently described in the various technical magazines, it is probably needless to go into details as to how the instrument is constructed, save for certain features which have enabled it to meet the demands of practical engineers and also comply with such laws of metallurgy on which a true hardness test depends.

The vital part of the instrument shown in Fig. 1 consists of a glass tube about 11 ins. long, ½ in. outside diameter and somewhat less than ¼-in. bore. This tube is graduated behind into 140 equal divisions. The object of the bore is to form a guide for the little drop hammer previously mentioned. Mechanism is provided for securely holding the glass tube, also for sucking up the hammer to hold it by means of a hook in readiness for a drop test; also some means for releasing for this purpose, and the manner of reading is then, to allow the hammer to drop on the metal to be tested so that it can rebound. About this hammer there is a little philosophy, which, if ignored, it would probably make this method useless as a means for testing hardness. The rebounding

is always in proportion to the hardness and which is read against the scale just at the moment that the indicator hammer comes to a rest and starts to fall back again.

A drop hammer falling on a hardened steel for example will always rebound, but this rebound does not necessarily indicate quantitative hardness unless the striking face, or area, has certain relations to the weight and also height of fall of this weight. If the striking area is too large in proportion to the other factors it may fail to cause any permanent change on the surface, so that nothing but the elasticity of the two bodies is indicated. When, however, the striking area is so proportioned in relation to the weight and height of fall that in the hardest steel a clearly defined permanent set is caused, in other words, the elastic limit has been exceeded, then of course the elasticity is not shown, but the hardness of the metal is, and the rebound will be very much less. It is needless to say that the elasticity is not completely annihilated, for the scleroscope indicator is actuated by the elasticity remaining after exceeding the elastic limit.

Perhaps this can be explained in some way that is more tangible. Thus, if we bend a piece of spring wire to an angle of 20 degs. and it is practically within 1 per cent. of its elastic limit, the spring will straighten out absolutely on release of the stress. This is equivalent to a scleroscope drop hammer which has a face too large to make a permanent impression. If the spring wire, however, is bent, say 25 degs. instead of 20, and the stress is released again, it will jump back the 20 degs., representing its elastic limit and elasticity, but it will suffer a permanent bend of 5 degs., representing the flexure which was beyond the elastic limit, and there is a certain amount of energy lost or converted into heat because of the permanent set. The total amount of power required to bend the spring may be compared to the intensity of the blow struck by the point of the scleroscope hammer.

As said before, it must be intense enough to cause a permanent change in the metal, so also must there be pressure enough to cause a permanent bend in the spring wire referred to. Both of these will fail to return to their original position, depending on the amount of permanent set caused in each instance. In the scleroscope of course, we must find the elastic limit by the use of a blunt faced hammer as against one which has a reduced area. Then, in the standardized scleroscope there is a drop in the highest rebound of about 20 degs. In other words, if the blunt-pointed hammer would rebound to 120 on the scale it would, when balanced and standardized for testing hardness, only read about to 100 on steel that has been formerly adopted as the standard 100 hard. In bending a soft metal to 25 degs., which we will say is half as hard as the first piece, it will be noticed that there will be a much larger permanent set, 15 degs., instead of 5 degs., and there will be an elasticity of only 10 degs. When the scleroscope is applied, it will show results which are in agreement, and this is again proved by the much deeper impression or penetration made by the little drop hammer, and this process is continued throughout the whole range, from the softest to the hardest metals.

Among non-metallic substances carbon is commonly tested by the scleroscope, but no attempt has as yet been made to compare the readings obtained with metals. The hardness of wood is obtained by dividing the readings by 6, for the reason that its fibrous structure gives it a resiliency six times greater than a perfect solid as metals. The hardest wood is thus found to compare with a metal 10 hard.

Owing to the fact that the scleroscope indicator hammer rebounds after striking the metal, it has lead many to suppose that in reality it measures elasticity. While this is not the case, there is a rather close relation between elasticity and hardness in perfect solids because the elastic limit of any metal becomes higher and higher with the increase of physical hardness. That the scleroscope discriminates between elasticity and hardness insofar as the rather slight difference exists, is proved by a steel that is glass hard on the one hand and the same tempered to a spring on the other. With a blunt point on the hammer, the one tempered to a spring shows as high or higher a rebound as the glass hard one, while the standardized hammer usually shows a drop of 35 per cent. in hardness, due to tempering.

URGENT NEED FOR A UNIVERSAL STANDARD.

It is needless to point out the fact that the world is in need of a more universal standard method of expressing hardness. A chemist now has a symbol for the various elements, which are universally understood in all parts of the world, while in the measurement of heat we are not quite so fortunate. There are, however, but two important standards, and furthermore, we have a method of resolving one into the other. We also have means for resolving a millimeter into fractions of an inch, but when it comes to resolving one hardness reading into another, there is much disappointment and confusion. There are any number of hardness testing machine manufacturers who use the Brinell method, or the ball test, but are operated in different ways, while there is no doubt that they all show the same property, they are read very differently, one against the other, which is due to the fact that calculations or other supplementary measurements have to be made, and obviously so long as this condition exists there will be a lot of confusion, and therefore it would be highly appreciated by those who have to deal with metallurgical subjects, if some means were provided for comparing different methods with a standard. It will of course be a question in the mind of the engineering world which of the several instruments now on the market should be taken as the universal standard with which all others should be compared.

The inventor of the scleroscope, like the inventor of any other instrument, would prefer that this instrument should be selected, but since it is the object of this convention to recognize only the intrinsic merits of anything that is brought to its notice, he thinks there is a chance for him to have a voice in the matter. The principal reason why he would suggest the scleroscope as most convenient and reliable is that it is direct reading and the principle is as nearly perfect in that all the factors which enter are constants, except one, which is a variable, and that is necessarily the condition of the metal upon which the little point falls, and does the indicating by rebounding.

When the ball method is used in most instances some form of constant pressure is applied to cause the impression. This pressure must be regulated to fit the hardness; in other words, a pressure test is suitable for obtaining a reading on steel will be too high for the soft and non-ferrous metals. Now here is a discrepancy, for it is not known exactly what pressure to use in each instance, while again the pressure indicator may be slightly in error, while if the metal is hardened steel it stands to reason that a hardened steel which may be superior in hardness, and it is also not possible to get the little balls used of the same hardness at all times, meaning practically that this method cannot be used at all on hardened steel.

Mr. Brinell has designed a ball test machine which uses the drop hammer principle for causing the im-

pression, which I regard as a step in the right direction in that it has reduced the variable factors by putting a limited amount of energy in the falling weight the same as the scleroscope, and which, according to the well-known law, would strike a blow of less impact and intensity as the resisting medium becomes softer; but here, also, this method is limited to testing steel in the softer condition.

The diamond scratch method, which is very little used, as we have seen in the foregoing, bears no relations to the elastic limit, and is therefore not strictly a hardness testing instrument. The scleroscope is on the instantaneous or shock plan, and is therefore in keeping with the character of the stresses which are most in common use, for even on bridges the load is not constant, but in the form of vibration, and it is very much more accentuated on machine parts, such as springs, crank shafts, gears, rivets, screws; and in tools the stress is almost invariably vibration of not actually in the form of shock load. Thus I regard the principle employed as nearly very perfect.

Owing to the fact that a fine diamond is used, it is the only instrument now in existence that is capable of measuring the entire range of hardness in metals, and even much higher than this, for should anyone be able to produce a steel having extraordinary hardness, the scleroscope would at once indicate it, as it is in its present standard form.

A SHORT ACCOUNT OF THE BIRMINGHAM BRASS TRADE.

A Description of the Oldest English-Speaking Brass Town.

By Richard J. Keates.

EARLY HISTORY.

It may well be said that the story of the rise and progress of the brass trade in the capital of the Midlands would be a fair guide to the increase of the city's wealth, population and industry, the widening of her boundaries, and the uplifting of her status and influence, till she has now grown to be the third great city of the Empire and can take a prominent position among the industrial centers of the world. For the fortunes of Birmingham are bound up in the brass trade. What cotton is to Manchester, wool to Leeds and Bradford, steel to Sheffield and leather to Northampton, so is brass to Birmingham.

THE UNIVERSITY, BIRMINGHAM.

The historian Hutton states that the manufacture of brass was introduced into England about the middle of Elizabeth's reign (A. D. 1580), but the first brass works erected in Birmingham was in Coleshill street in 1740 and belonged to a family named Turner. The chief sources of raw material were from the Macclesfield, Cheadle, and Bristol companies. Mr. Keates, of the Cheadle Company, recollected that the calamine ($ZnCO_3$) was brought from Derbyshire on the backs of mules.

In this connection it is noteworthy that the copper and spelter used in Birmingham today are chiefly from foreign sources: the one coming from Spain, Japan and the United States of America, and the other from Belgium. But against this absence of natural and local resources is to be set a kind of hereditary skill in the manipulation of metals which is handed down from father to son. This may not be altogether desirable. It is to be feared there is more than one brass works in Birmingham where business is carried on precisely as in the days when Mr. Aitken wrote his account of the trade in 1866. And while the fact of a business being in the hands of the same family with traditions and methods going back, back until the antiquaries stop out of breath and fan themselves among the records of a hundred years ago, may well excite awe and respect; in all probability that business is suffering from impoverished blood and sadly requires bringing up to date.

The earliest directory containing any allusion to the brass trade in Birmingham was Myles Swinney's, dated 1774. It contained 36 names. In striking contrast to

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this are the following figures from an authoritative source:

Year.	Annual Consumption Brass and Copper.	Number of firms employed.
1860-5	30,000 tons	420
1872-6	50,000 "	550
1890	100,000 "	800
1905	150,000 "	950

The price of tough pitch copper in 1860 was £119 and spelter £26.10.

THE COMING OF STEAM.

A great impulse was given to the brass trade in Birmingham by the opening of the canal systems in 1769. The collieries of Staffordshire, being at last directly connected with the Birmingham furnaces, the prices of coal and raw material became cheaper. But the greatest impetus was the advent of the steam engine, then made on Newcomen's principle. The famous partnership of Matthew Boulton and James Watt at the Soho works, however, gave still another incentive by means of their celebrated engine, and as W. J. Davis has said, it must be a gratifying recollection for the brass founders of Birmingham that their trade had even indirectly a connection with that tremendous invention, the steam engine.

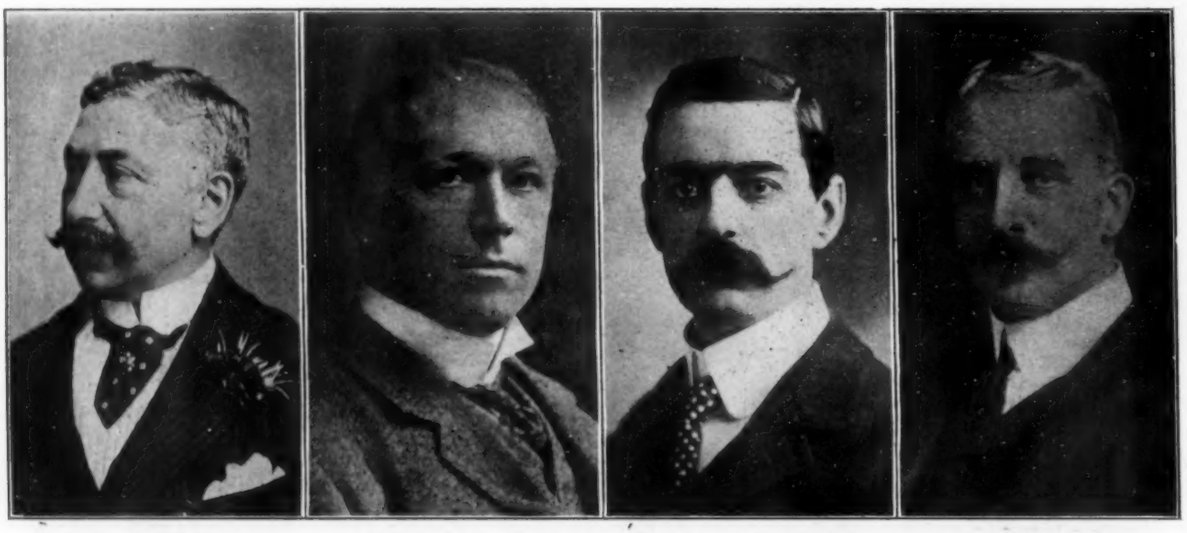
Immediately its results began to be felt. Power, for which the employers had been waiting for years, meant reduction of labor, increased output and infinitely more satisfactory work. The old journeyman brassfounder and apprentice are practically obsolete in Birmingham at the present day. The era of handwork except in particular instances, such as repoussé copper work, is over, and the inevitable person "who has made two blades of grass grow where one grew before," has changed the aspect of the trade within almost the last decade.

Consequent upon the harnessing of steam and electricity for power purposes came all the improvements in production, processes, machinery, etc. In this connection may be mentioned the oil and gas fired revolving furnace requiring no crucibles and pouring directly into moulds, the moulding machine and metal mould for repetition work, the automatic capstan lathe, tube and wire-drawing machines and the special machine-tools of the brothers Taylor, Timbrell & Wright, etc.

The introduction and perfection of the bronzer's art of plating and coloring to an infinite number of shades has also had a strong influence upon the trade; in fact, so large has this latter industry grown to be within recent years side by side with the brass trade, that its story is worthy of a separate article.

It is not always realized in speaking of the brass trade in Birmingham what a large amount of capital, complication of interests, and infinite variety of results are represented. It is like some huge monster originally indeed of copper and spelter, but now covered with knobs and excrescences of gun metal, Muntz's, Delta, and the many other alloys including the white metals which are worked every day in Birmingham. All these are made at works designated "brass works," although they may handle besides copper and brass, alloys containing tin and nickel for the electro-plate, harness and art metal trades. Besides the white metals, many of them known by special names, "Silveroid," "Potosi-Silver," "Argentite," "white brass," etc., there are numbers of various alloys for the different branches of the trade which are required to be worked in the same manner as, and side by side with, brass. Of these is gun metal varying from the mixture specified by our admiralty to anything of a ruddy color and probably containing up to 2 per cent. lead for the steam fitting trade: Muntz and Delta metal to be mentioned again later; hard solder for brazing purposes and the alloys containing phosphorus, manganese, aluminum and silicon.

PROMINENT BIRMINGHAM MANUFACTURERS.



J. H. CARTLAND.
James Cartland & Sons, Ltd.

RALPH HEATON.
"The Mint," Ltd.

NEVILLE CHAMBERLIN.
Elliots Metal Company, Ltd.

SIR GERARD MUNTZ.
Muntz Metal Co., Ltd.

The following are some of the forms in which the trade has been developed in Birmingham:

Metal merchants: Scrap, borings and dust and scrap dealers.

Brass casters (subdivided into common, common fine, false core, etc.).

Designers, modellers and patternmakers in wood, brass or iron for the trade.

Cabinet brass founders, making chiefly, in cast brass, articles for the upholstery, drapery and furnishing trades.

Railway and naval brass founders.

Engineers' and plumbers' brass founders.

Stampers and spinners, making an infinite variety for direct trade as well as for the other branches, to work up with the addition of cast pieces, hammering, bronzing, etc.

Art metal and repoussé workers.

Bell founders.

Harness, motor car, chandelier, gas and electric fittings manufacturers; carriage and other lamps.

Buttons, badges, medals, military and naval ornament makers.

Nails, rivets, bolts and nuts.

Bedsteads.

Wireworkers and weavers, pinmakers, brass chain makers.

Rolling, wire and tube mills.

Specialized works, such as those making nothing but replicas of antiques, candlesticks, door knockers, etc., for Wardour street and Brompton road. Arm and leg-ring makers for Indian and African markets.

The above, by no means comprehensive list, will show the variety of manufactures that is embodied in the term "brass trade."

It is curious to contemplate the enormous amount of energy put forth individually by the multitude of small firms in Birmingham: each striving (and in the majority of cases succeeding) to pay its way and all feeling competition keenly. It is also permissible to speculate whether our Waterbury cousins in the Fenimore Cooper Valley* have not seen a little further than the brass founders in Birmingham in the forming of their associations and combinations: the one for practical and the other for commercial and financial purposes. At any rate, four of the principal firms in a certain branch of the trade here in England have seen fit to join forces with a united capital of £150,000, at the instigation, if rumor is correct, of the only Birmingham firm represented in the combination.

IMPROVEMENTS AND INNOVATIONS.

Perhaps one of the most striking features of the brass trade is its practically absolute concentration in Birmingham. That is to say within an approximate radius of four square miles in a city of 520,000 inhabitants with a municipal debt of over £15,000,000. It must not be imagined, however, that efforts have not been made to deflect the trade from Birmingham to other parts of the kingdom. Manchester has been always a serious competitor in many branches of the industry, but it has been in those two great and valuable markets, the Clyde and the Tyne, where the greatest efforts have been made to transplant the trade. At present, however, these efforts have been unavailing. Locomotives and steamships, therefore, are still using Birmingham made condenser tubes and firebox plates, and there is no reason to think that the admiralty either of this or many another country has cause for complaint if these goods should invariably be made in the Midland capital.

The statement of Aitken, therefore, previously mentioned about hereditary skill, would seem to be confirmed by actual history. It is no unusual sight to see three generations of the same family actually working in the same works and there must be some technical skill in the manipulation of metals, which is handed down from

PROMINENT BIRMINGHAM MANUFACTURERS.

T. R. BAYLESS,
Kings-Norton Metal Co., Ltd.
Manufacturers metal wire, cartridges, etc.

R. G. EVERED,
Evered & Co., Ltd.
Manufacturers metal goods.

G. H. DUGARD,
Heaton & Dugard, Ltd.
Manufacturers metal rollers, wire drawers.

The last division is a particularly interesting one, since it also hints at the specializing which is carried out by many of the smaller firms. Thus for example, one firm will manufacture nothing but shop fittings; another would not entertain any business but that in mandrel-drawn tubes of the lightest gauge and smallest diameter for pencil-cases, etc.; while yet another would courteously but firmly direct you to another address for water fittings suitable for the South American markets, making only the heavier and more expensive varieties themselves. And so the trade has been divided and subdivided with its varied interests until it has arrived at its extraordinary position today. A vast, unwieldy industry, employing at least 50,000 hands, from the humble moulder and girl coremaker and "dogger-up" to the typist or designer and manager, and turning out annually a value of what a conservative estimate puts at five million pounds sterling. And yet as was stated in a recent article in THE METAL INDUSTRY (February, 1910, page 42), it is practically unprotected.

*The Naugatuck Valley Brass Trade, THE METAL INDUSTRY, January, 1910.

father to son in the casting or work shop or office. At the same time it must be admitted that exceptional facilities are offered to the metal worker of whatever position, old or young, to study his trade from all points of view and fit himself for his struggle in the brass world.

EDUCATIONAL FACILITIES FOR THE BRASS WORKER.

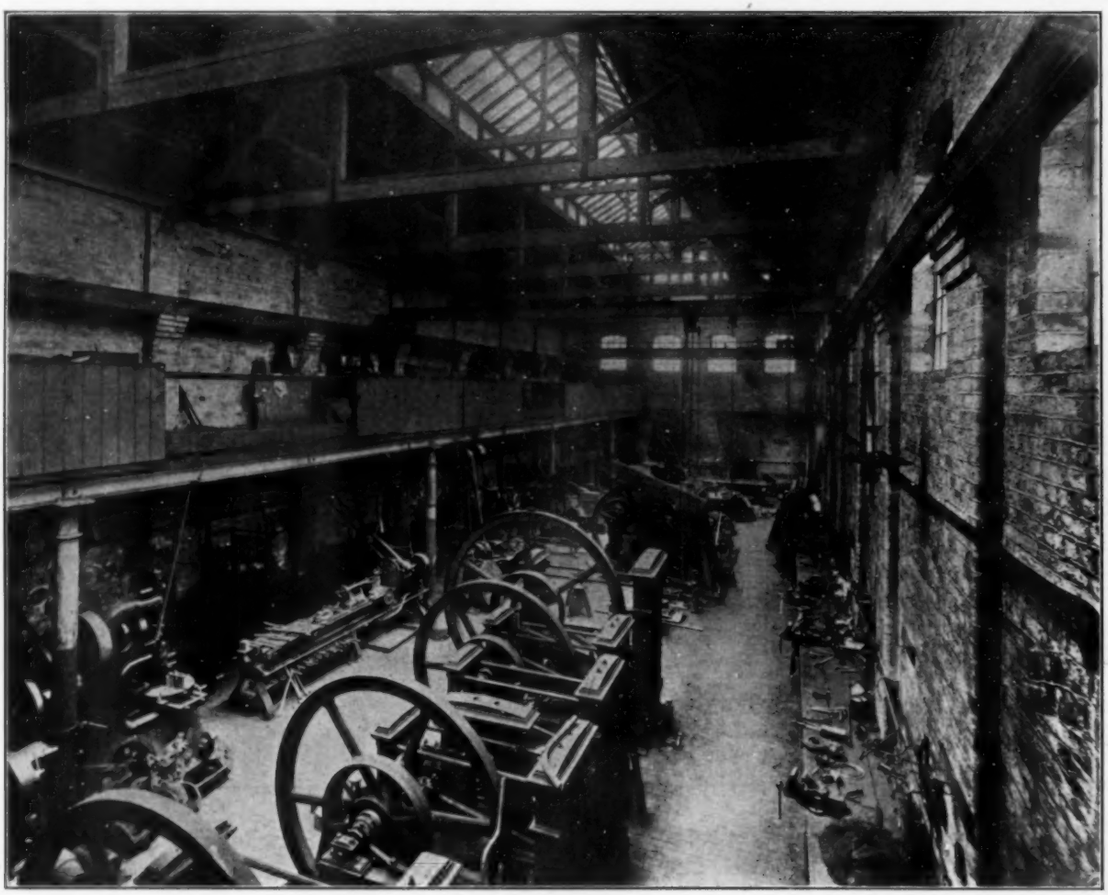
The University—admittedly one of the most effective educational machines in the world—the School of Art and the Technical School, all proffer special courses which may be particularly acceptable to a brass worker. Modelling, designing, casting or working, bronzing and lacquering, together with scientific study of the metals and their alloys—all these are easily accessible to the brass man in Birmingham and needless to say they are eagerly accepted. At the Technical School, for example, there is a continually changing procession of students to the number of 3,000 yearly. Frequently one may see here at an evening class when business is over for the day, a master and his foreman working side by side on some special work, searching for the key to some riddle that has been propounded in the works; or perhaps evolving some new shade of bronze coloring which will enhance the salability of a certain article about to be launched on the market.

Such names as Professor Turner of the University, and Stansbie of the Technical School and Catterson Smith of the Art School have by their books and teaching left their marks on the Birmingham brass trade and it would be difficult to appraise the value of their efforts from a practical and commercial point of view, as well as from a scientific. One can faintly picture the great Matthew Boulton's astonishment if it were possible for him to visit the metallurgical department of the Technical School, say at 9 p. m., in the middle of a session. Last but not least of the innovations has been the founding of the Institute of Metals in 1908, which after only 18 months' existence can already number over 500 members. In no trade, perhaps, have what are known as "secrets" been so jealously guarded as in the brass and allied trades, and now at this Institute such "secrets" in theory and practice may be calmly discussed and deliberated by the scientific and the merely mercenary and also the purely practical. And what is more to the point, the results of their deliberations are set forth at length so lucidly and concisely that he who runs may read.

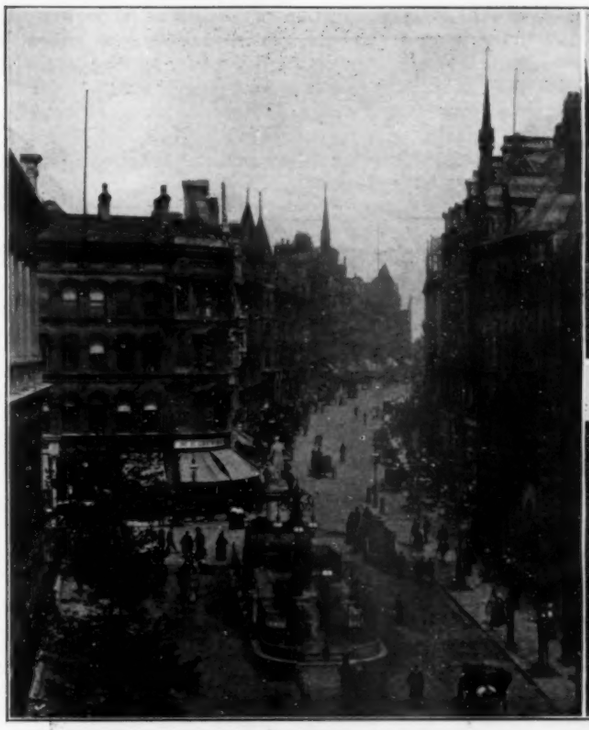
SOME WELL-KNOWN WORKS.

Birmingham has been the nursery and the school of the brass trade; it might almost be said that anything in a non-ferrous metal can be made in the city. The trade has always been very strongly represented in the civic life of the city: several times have the people conferred their biggest honor, that of chief magistrate (Lord Mayor), on the trade, besides the councilors and justices who take a prominent part in the government of the city.

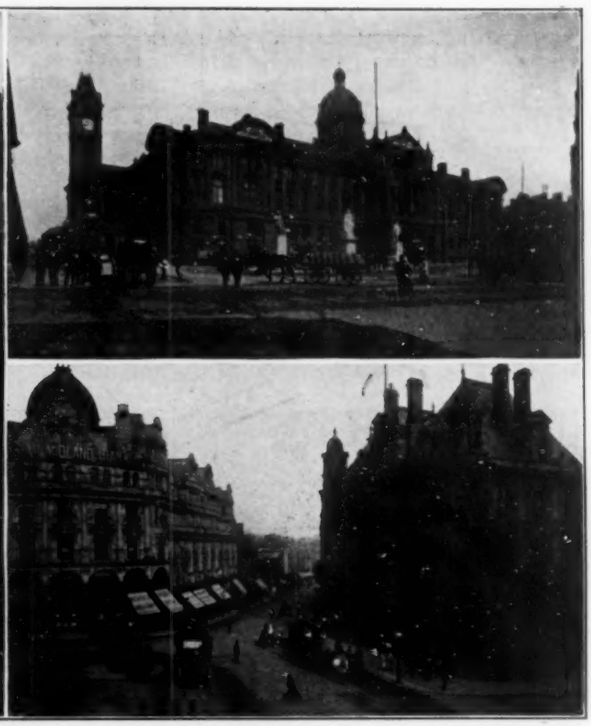
Such names as Winfield, Muntz, Cartland, Evered, Wilkes, Mapplebeck, Elliott and many others are universally known in the brass world. It would indeed be a difficult matter to discover a market where some evidence of the great Birmingham industry could not be found. A good example of the hereditary skill previously mentioned is found in the case of the firm of Evered. In 1809 Rich-



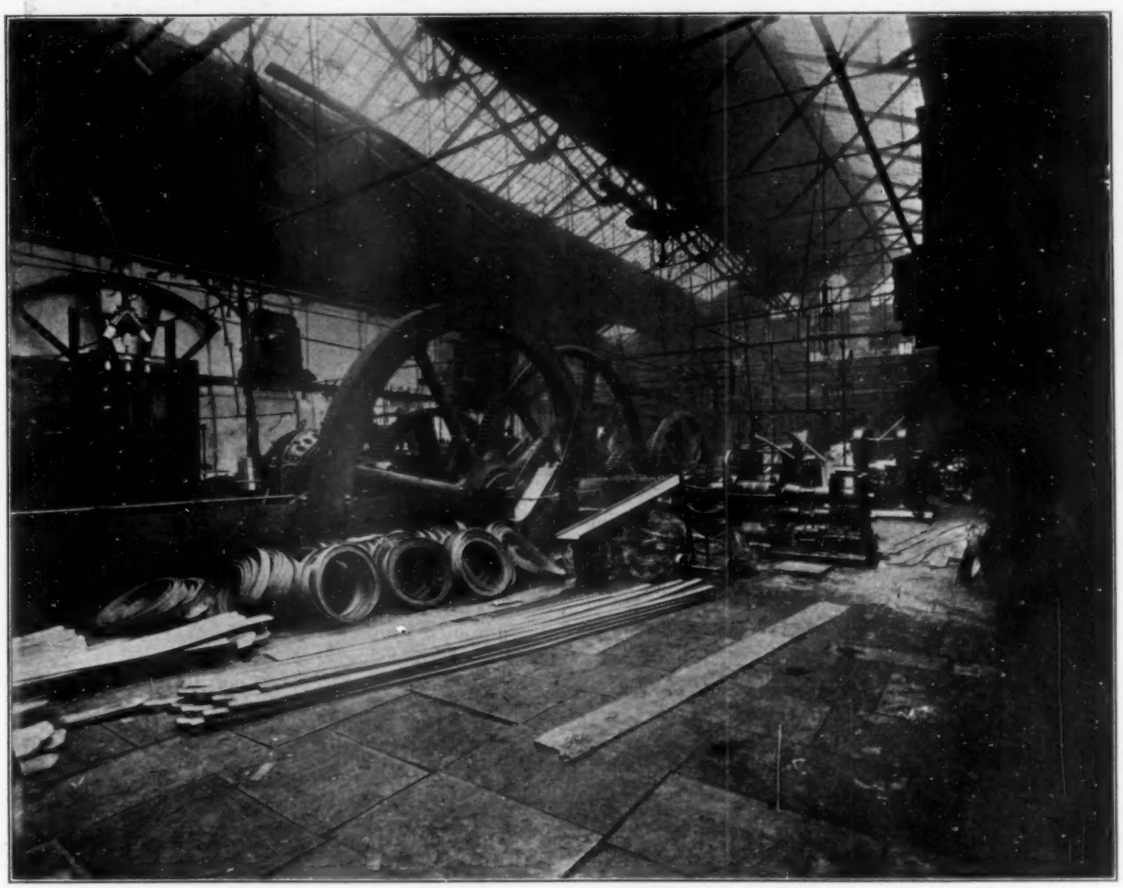
THE FITTING SHOP. "THE MINT," BIRMINGHAM, LTD.



CORPORATION STREET, BIRMINGHAM.



COUNCIL HOUSE AND VICTORIA SQUARE, BIRMINGHAM.
NEW STREET, BIRMINGHAM.



COLD ROLLING MILL FOR BRASS AND COPPER. "THE MINT," BIRMINGHAM, LTD.

SCENES IN BIRMINGHAM.

ard Evered commenced as a brasscaster employing perhaps half a dozen men. Today there is a fifth generation in the firm which employs about 1,300 hands; and as regards the scope of the business, instead of being limited to one branch (casting), it now comprises practically every department of industry into which brass largely enters. It cannot be said that this firm at any rate is not up to date in spite of its wonderful history and traditions; the latest automatic machinery and processes combined with the recent electrification of the works places it in a position which many another might envy. It is interesting to note that during the partnership of Mr. Richard Evered with a Mr. Lambert, which appears in the London Directory of 1835, tube was drawn by power furnished by horse-gear!

Perhaps the most famous works in the Birmingham district is the famous Soho Works, formerly occupied by Matthew Boulton in 1762 and of course when he was joined by James Watt. In 1786 one hundred tons of bronze coin was struck for the East India Company. Steam power was of course used and among other great improvements were the attainment of almost mathematical accuracy in weight and size and also the raising of the edges of the coins so as to prevent defacement by rubbing. The works are now in the occupation of Messrs. W. and T. Avery, Ltd., the well-known scale-makers and weighing engineers.

Since the cessation of coining at Soho a large amount has been carried out at Messrs. Ralph Heaton & Sons, Ltd., The Mint, Warstone Lane. Here the first gold coinage was made for the Transvaal in 1874. In the following year an order for one hundred tons of bronze coins for home was received. Some idea of the extent of Messrs. Heaton's connection may be gathered from the fact that they have made coins for Germany, Norway, Servia, Nicaragua, France, Denmark, Hayti, Japan, etc., besides a large variety of medals. Now the firm combine the manufacture of rolled metal and wire and various brass fittings with their coining.

One of the oldest works in Birmingham is that of Messrs. Chas. Clifford & Son, Ltd., of Fazeley street and Dogpool Mills, who carry on the manufacture of tubes, sheets, rods and wire in brass, copper and bronze. Within a few years ago a beam engine was working at Fazeley Street Works, which a mechanic named Pickard built in 1767. Dogpool mill was driven by water power, and here in 1819 was patented a composition pipe of copper and lead warranted not to burst under the pressure of the then new mysterious illuminant coal gas.

SEAMLESS BRASS AND COPPER TUBE MILL, "THE MINT," BIRMINGHAM, LTD.

The invention of Muntz metal alloys in 1832 gave a tremendous impulse to the trade. These alloys of Mr. G. P. Muntz, varying from 56-63 per cent. Cu and 44-37 per cent. Zn, were especially suitable for bolts and sheathing of ships, superseding the far more expensive copper, not only on account of price but also because the ships' bottoms were kept cleaner. Here again is a story of progress and expansion, while the family still retain the leading position, the present head being Sir Gerard Muntz, Bart., President of the Institute of Metals, whose ancestors came over from Poland via France in the time of Louis XVI.

Another celebrated alloy known to the world as Delta

metal is made in Birmingham. Brought out in 1883 by Dick, the Greek initial of whose name gives the alloy its name, and made by the extrusion process, it is widely used by nearly all branches of the trade.

A notable fact is that the high conductivity wire for the Atlantic cables are made by the firm of Wilkes Mapplebeck. After the parting of the first cable, the wire was, at the suggestion of the firm, composed of several strands. The approximate length of wire was 2,300 miles and total weight about 4,000 tons. This was successively laid by the "Great Eastern" in 1865. E. P. W. Mapplebeck, the present head of the firm, is the great grandson of the founder, thus representing a fourth generation.

Who has not used or does not know the "Duplex" lamp? Mr. Hinks was the original inventor of this idea which was destined to revolutionize the lamp trade. It was the case of a man with an idea who first appreciated the possibilities of mineral oils, at that period comparatively new. Today, in spite of gas and electricity, Messrs. J. Hinks & Son, Ltd., are turning out more lamps than ever. Since the concern was turned into a limited company in 1872, half a million pounds has been distributed in dividends and bonuses.

Within forty years ago the venerable method of producing brass known as the "calamine method" was in use in Birmingham. This consists in mixing metallic copper with oxide of zinc ($ZnCO_3$) and charcoal, heating strongly, and the zinc then reduced by charcoal and carbon dioxide, alloys with the copper forming brass. Matthew Boulton's propositions for calamine brass were for every 2 tons of copper and 3 tons of prepared calamine, he would get 3 tons of brass. But with the varying composition of the ores and materials handled and the temperatures, etc., it was a matter of great difficulty to obtain anything, approaching uniformity of composition.

It is only possible to enumerate a few of the larger and more celebrated firms in an article like this, but to do justice to the subject, the list might be extended to fill many pages. Take such examples as the great bronze doors, 8 ft. x 16 ft., of the Rio de Janeiro State Library; chandeliers, 9 ft. x 7 ft., at Bombay cathedral; candelabra at Windsor and Buckingham palaces, and, in contrast, the turbine blades for the Mauretania—all have been made in Birmingham as well as the curious coinage known as "Manilla" rings for Equatorial Africa and brass rods which are current coin on the Guinea Coast

Pleading exigencies of space, therefore, it is to be hoped that a fair idea has been given of the volume, variety and value of the Birmingham brass trade, which has become famous in all markets of the world, and has evolved the genus known as the "Brummagen Button."

CHANGES.

In the history of a trade like the brass trade changes of course are manifold and far reaching. The commercial spirit of the age has brought about many of them, no doubt, but also has that wonderful production, the modern scientist. It has become almost within the last few decades an age of system and detail both in office and works. And so to a large extent the successful heads of departments in a particular business and even the skilled workman himself, have been able to start where their predecessors left off. Take for instance the case of what is known as shop dirt which includes filings, sweepings, etc., from a shop where some operations in brass have been carried on. This shop dirt in Hutton the historian's time fetched about 10/5 a load and was used to mend roads! Comparison will not be difficult if it is mentioned that average shop dust, fairly clean, is worth anything from £30 per ton. And while there were only three refiners in Birmingham fifty years ago, there are at least five times that number at the present day. The chief changes, however, in the trade appear to have come from without rather than from within.

In 1769 a London jeweler was working at a device which was to inaugurate a new era in the brass industry—that of stamped brass foundry. It was soon appreciated that there was practically no limit to the possibilities of stampings made by machinery coupled with fertile imagination. And at first it did seem as if the old original honest casting was doomed. Since then, however, it has been found that there is room for both the caster and stamper to work amicably side by side and in many cases it is their combined efforts that are utilized to accomplished the required work, and attain the desired object. Stamped brass foundy constitutes a very influential and numerically large portion of the trade. Fresh uses for stampings are being discovered almost every day—the electrical trade being a large customer. Brass chandelier chain is now made in Birmingham throughout by machinery, and the same firm has laid down special plant for the production of turbine blades.

Another change which the Birmingham brass founder has experienced has been brought about by the employment of iron and coating it with brass either by mechanical or electrolytic means. What is known as "cased tube and rod" (said to be first produced by Benjamin Cook in 1812 and applied to bedsteads), iron tube and rod with a thin skin or case drawn over it; electro-brassed iron articles for household, railway and tramcar work, frequently bronzed to a variety of shades; all these have worked material changes in the brass works where it is not unusual to find a cupola as well as a brass plating plant among that most busily employed.

Such a subject as the rise and progress of an industry like the brass trade in Birmingham can only be treated with brevity in an article such as this. At every turn so many features of interest in history, theory and practice present themselves, that it is difficult indeed to avoid digression and become discursive treating of one branch of the trade at the expense of another and perhaps equally important one.

Of the immediate prospects of the trade, it is very difficult to speak with anything approaching certainty. There does not appear to be any signs of a decline in demand for brass and copper in their manifold forms, rather an increase from year to year, so that manufacturers do not exercise themselves much on that score. On the other hand, however, the cause for so much apprehension and gloomy forebodings and desperate prophecy is the extraordinary competition which is now prevailing among the various manufacturers.

Presumably this has to a large extent been brought about by the great improvements in machinery and processes and by the intelligent application of technical education which the brass trade has seen during the two hundred years of existence in Birmingham. But it is certain that the rate of supply has increased and prices have diminished out of all reasonable proportion, and whether the celebrated law of compensation will assert itself in the brass trade and regulate these inequalities, is hard to say.

In the writer's opinion the prospects are not very bright nor does it seem possible to render them otherwise unless some concerted action by the trade is taken to protect its interests. For it must be borne in mind that foreign competition (and by that is meant especially German and American) will not diminish as the years pass unless ———, but politics must not be introduced into this article. The intelligent reader will doubtless be able to fill in the hiatus and appreciate the sentiment to the full.

THE MANUFACTURE OF WROUGHT BRASS.

A Description of Modern Methods in the Production of Plate, Sheet, Rod, Wire and Tube.

(Continued from April.)

By L. J. Krom.

After the molds are oiled—there are usually ten to each set, one mold for each pot of metal—they are closed up; that is, the front is lifted over onto the back and they are then banded together by means of iron bands. These bands are usually made of strip iron of square section welded together in the shape of a flattened O. The bands slip on over both back and front and are held in place by driving in tool steel wedges between the band and the outside of the mold. The wedges are made of square section and taper to a blunt point. The bands are put on the molds about two feet apart, so that a ten-foot mold will have five bands with two wedges to each band.

This method of closing the molds is very convenient as it holds the two halves of the mold tightly together and allows no metal to leak out of the edges. On the other hand after the metal has been poured in, a slight tap on the band causes it to slip down from the wedges, which then fall out and the bands can be dropped to the bottom, leaving the mold ready to be opened and the cast bar lifted out.

POURING THE METAL.

About the time the molds are ready, the metal will be melted, mixed and stirred, and will be ready to pour. The pot, or crucible, is then grasped by a heavy pair of tongs, shown in Fig. 2, put in place by the first helper or furnace man; the second helper or mold man then "pulls" the pot from the fire by means of block and fall rope tackle on the end of a light wall crane or a crane set in the floor between the fires and mold pot. Various mechanical devices have been and are being tried for "pulling" a pot from a pit furnace but do not seem to answer as well as "man power." The pot is swung over to an iron plate set in the floor of the shop, the caster approaches and skims off the dross and remainder of the charcoal and other fluxes used in the melting processes. If any tin or lead are to be added to the mixture this is when they should be put in and the whole given a vigorous stirring with a plumbago rod in the case of rich mixtures, and an iron one in the case of the ordinary brass.

POURING TEMPERATURES.

With the introduction of modern methods into the brass casting shop, pouring temperatures are receiving much intelligent attention. Twenty years ago the only method a caster had to tell when his metal was ready to pour was by the eye and the "feel" when he put in his iron stir bar. If the metal seemed to be fluid enough and a gentle tremor was felt on the bar, the pot was ready to pour. Nowadays the use of the pyrometer has come into play in a great many shops and the temperature is easily gauged and standards are adopted for various mixtures.

In a general way we may say that the melting or fusing point of ordinary brass is from 1,750 to 1,800 degs. Fahr., but with all the various mixtures it is practically impossible to tabulate the fusing points definitely, but it is possible to set up standards for the various classes of mixtures used. The best rule to use in most mixtures of brass is to pour the metal at as near its fusing point as is consistent with the conditions attending the case. In the case of leaded brass this should be poured quite hot, so that the metal is thinly fluid, and at the same time the cast bar should be chilled as rapidly as possible in order to check the segregation or settling out of the lead. Bronze mixtures containing tin and lead should be poured at rather a low temperature in order to aid in the prevention of contraction which causes the bar to crack as it cools.

As all of the brass mixtures that this article treats of are intended to stand rolling, drawing and other mechanical operations, the pouring temperature and also the condition of the molds in which they are poured are of the utmost importance.

A very good practice that is followed in some mills, is to arrange the caster's daily work so that the first two rounds, or twenty pots, are composed of leaded brass, thus insuring cool molds for this metal, then finishing the day's work with the mixtures running higher in copper that are benefited by a slower cooling. Some mills, however, object to this method, as they claim there is more chance for contamination of a mixture that should be free from lead by the leaded scrap used in the first two rounds. With a little care this danger can be easily avoided and water cooling of the molds is eliminated.

HANDLING THE CAST METAL.

After the "round" has been poured and all the crucibles have been put back into the furnace, the fire coaled up and the metal charged into the crucibles for the next round, the caster either weighs out the metal for the next rounds, or if this is done in a weighing department, he sits down and starts to eat or talk over casting problems with a fellow caster. The helpers then knock down the bands of the molds and pull the bars of metal out of the molds onto the floor, using what are termed "metal tongs," shown in Fig. 2. With large, coarse-cut files the edges of the bars are filed or smoothed down so that no projecting "fin" is left to interfere with the subsequent mechanical processes that the metal has to undergo. The bars are next swept off with a wet broom, piled on an iron truck, ticketed with the caster's name or number, and taken to the weighing room.

TREATMENT OF THE WASTE.

After the last round of the day is poured the "cleaning-up" process begins. In most shops the average day's work consists of from four to five rounds, running from ten to twelve pots per round, making in all from forty to sixty pots and aggregating from 8,000 to 10,000 pounds of metal per caster. From this amount of metal cast it will be readily understood that there is ample opportunity for waste metal due to careless and indifferent handling of the materials. With careful work, however, a good caster will keep his "loss" down to practically only the calculated legitimate shrinkage which is generally conceded to be from loss in spelter alone.

In "cleaning up," the floor is carefully swept up around the fires and molds, and all spilt metal is collected. The skimming pile is screened in order to get out the coarse shots of metal that it may contain. The fine product that remains is usually thrown in with the ashes of the fires. These ashes, as soon as they are cooled enough to handle,

or after they are wet down, are shoveled up and taken to a "wash house." Here, by means of a system of crushing and grinding and final washing either in sluice boxes, on a jigging machine or by a concentration table, the last possible bit of metal is extracted, dried, treated by a magnet machine and returned to the casting shop. The weight is credited to the shop as scrap returned. In some shops there is in use a system of skimming the pot of metal into water. A tank is sunk in the floor and half filled with water and the skimmings are dropped into it. An effective separation of the metal from the dross is claimed for this process, but from its past record it would seem that whatever advantages are gained over the method described before are more than overcome by the danger attendant upon bringing molten metal in contact with water. For shops where a separate washing is made of the ashes from each set of fires, each caster is charged with the amount of metal returned, and figured against his efficiency as a caster if large, and in his favor if small. A good caster will show no more than 25 pounds of returned metal at the close of a day's work.

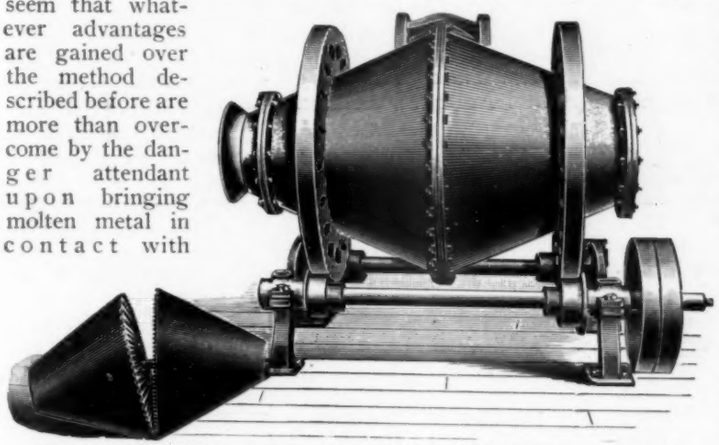


FIG. 4. MONARCH CRUSHER MADE BY O. J. MOUSSETTE COMPANY, BROOKLYN, N. Y.

As remarked before, the real legitimate loss in melting of brass mixtures is practically due to oxidation of spelter, and is figured today at between 1.25 and 1.50 per cent. on the gross weight of metal cast. The "tailings" from a modern wash house will show around .2 to .4 of one per cent. in metal, showing that over one per cent. is directly traceable to spelter loss. This showing is due to improved methods of recovery and is of only recent date. It is safe to say that there are cinder paths and dump piles still in existence in parts of the country that would show between two or three per cent. in metal. In fact, the writer is aware of some cases where old piles were worked over with good results.

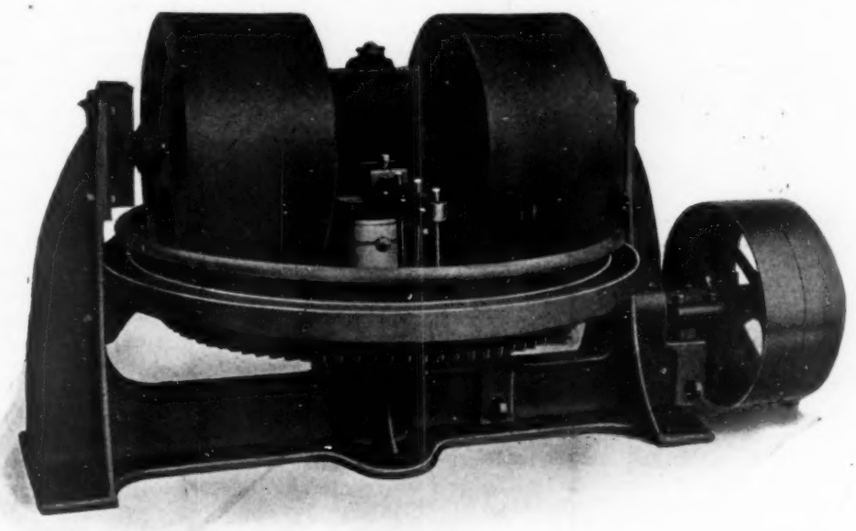


FIG. 5. CINDER CRUSHER MADE BY ANSONIA FARREL FOUNDRY AND MACHINE COMPANY, ANSONIA, CONN.

An up-to-date equipment for a wash house (this operation is invariably done with the aid of water, although some dry processes have been tried), consists of a stamp battery still being used in several instances; circular grinding machines shown in Fig. 5, which consist of a large pan in which two large rolls revolve in the opposite direction to the pan; crushing barrel, as shown in Fig. 4; an elevator for feeding the material to the grinding machines; a system of sluices with screens, etc., or concentrating tables with the accompanying machinery for automatic feeding.

Several grades of washings will be turned out of such a plant. The number one grade will be all clean metal, and consists of large pieces and shot which usually come from spillings or broken crucibles. This grade of "washings" can be used to advantage as straight scrap after being assayed for the copper contents. Number two grade consists of between 75 to 90 per cent. and is used sparingly in remelting. It is usually used in the leaded mixtures only. The last grade contains anywhere up to 75 per cent. metal and is both coarse and fine. This material is generally sold on a copper percentage basis, which is undoubtedly the best method of disposing of it.

TREATMENT OF THE CAST BARS IN THE WEIGHING ROOM.

The wagons or trucks carrying a "round," or ten bars of metal, are weighted upon their arrival in the weighing room. The bars are then taken to the large alligator shears, mentioned in the fore part of this article, and the "gate" is cut off. The size and weight of this gate depends upon the skill with which the metal has been treated in the casting. If the metal has been mixed and poured at the proper heat the "gate" will not weigh very much, in the neighborhood of from two to four pounds for narrow metal and from eight to ten pounds for the wider stock. The "gate," it may be remarked, is the "riser" end of the bar and is formed by the slight enlargement at the top of the mold. The object of the "gate" is to allow for shrinkage and also to collect any dross or dirt that may go into the mold with the metal. As a rule this material will rise to the top of the bar and is thus eliminated. The use of strainers or runner boxes on the molds has greatly reduced the amount of drossy metal.

(To be continued.)

THE PRACTICAL ELECTRO-DEPOSITION OF GOLD.

AN EXHAUSTIVE TREATISE ON THE SO-CALLED ROSE ROMAN, GREEN GOLD AND SIAMESE FINISHES.

(Concluded from July.)

BY AUGUST HOFFMAN

THE SO-CALLED GREEN AND ROSE GOLD FINISHES—TWO-COLOR WORK.

This class of work is not in such great demand, which is, perhaps, due to the expense attached to its production, but it may be well to bring our readers in touch with the process of obtaining two-color work. This finish is generally used on articles where a distinction in the design is desired, such as flowers and leaves, animals, scenes, scrolls, etc.

To produce the green and rose effect, the articles are first given a coat of green gold as described in the July number of THE METAL INDUSTRY (either light or dark) and then dried in sawdust, after which they are painted with black asphaltum, using a fine artist's brush for the purpose on all those parts which are to show green, after which they are allowed to dry until the "blocking," as it is called, becomes quite hard. A very gentle heat will help this operation, though care must be taken not to get the asphaltum too warm, as it will then crack off when put into the rose solution.

Next, proceed to make what is called a "cold rose solution" in the following manner: Dissolve in 3 pints of water, while heating, 10 ozs. C. P. cyanide of potassium, 5 ozs. ferrocyanide of potassium, 2 1/3 ozs. carbonate of sodium and ½ oz. of pure ammonium chloride. When these salts are dissolved add 9 ozs. fine gold solution. Now, replace the evaporated water to make 1 quart and allow to cool. This solution should not be used at more than 60 degs. Fahr.

Place the platinum anode over the rear side of dish, bending the wire in such a manner so as to immerse ¼ of the anode in the solution and leave it in this position, for in working a cold rose solution both the anode and article must be held as still as possible. Now, when the blocking has become quite hard, the article is placed on the hook end of a wire and immersed in the cold rose solution, where it is held for a few seconds, and then attached to the negative pole. It should be held very still until all the parts not painted are covered with a coat of gold (about 4 to 5 minutes) after which it is rinsed and dried with a gentle heat or in sawdust. Now place some turpentine into any convenient receptacle sufficient to cover the article, and when dry place the work in it and allow to remain until all of the blocking has been removed.

The article is then washed in a hot lye solution to remove all traces of grease, which can be ascertained by the fact that after rinsing from the lye solution no beads of water are noticeable, that is to say, the water will flow from the article freely. The next operation is to momentarily immerse in the following cold solution: C. P. Cyanide of potassium 5 ozs., water 1 quart, which, when dissolved, is called the cyanide wash or dip, and removes all stains from the article. It is then rinsed thoroughly first in cold then hot water, after which the article is rubbed on all the high parts (both green and rose) with bicarbonate of soda. Now rinse thoroughly and scratch brush very gently on all the plain parts, after which it is rinsed and dried in the usual manner. The aforesaid process will be found to produce a very beautiful finish and is known as two-color work; different effects can be produced in the same manner, such as silver and green, silver and rose, etc., by using the respective solutions.

THE MANNER OF OBTAINING THE SIAMESE FINISH, KNOWN AS ENGLISH OR GUINEA GOLD.

The siamese finish is beautiful in appearance, cheap and simple to produce in connection with the "finishing solution." The article to be finished is at first given a very high polish in the usual way, after which it is thoroughly freed from grease in the following manner: Make a strong solution of lye (about 2½ lbs. to a gallon of water) and heat to the boiling point, when after placing the article on a hooked wire, it is immersed in the boiling lye, then rinsed in luke warm water, which should be nearby, again in the lye, then in water and so on, until the water flows from the surface of the article freely and no beads of moisture are visible, after which it is immersed momentarily in the "cyanide wash" mentioned above, again rinsed in clean cold water and given a deposit of gold in the "finishing solution" in the same manner as described under the heading of "Producing the Roman Gold Finish."

I deem it of value to state that in my experience I have found that after rinsing articles finished in this manner, better results were obtained if they were dried with a clean, soft linen towel, in place of using the sawdust. Being a deposit of pure gold on a highly polished surface it is naturally soft and delicate, the sawdust is apt to abraze the surface, whereas, with the careful handling of a linen towel, the surface can be gone over without affecting or marring its beauty.

This finish can also be produced with a better wearing quality by giving the article a ten-minute plate in the Roman gold solution, after being polished as before mentioned, then scratch- brushed lightly with a small, worn-down, one-row scratch brush, rinsed and dried, after which it is again roughed to a high polish on a soft buff, so as not to take off the deposited gold and finally cleaned and flashed through the finishing solution as explained in the foregoing.

TREATING ON THE 14 AND 18 KARAT FINISHES.

The 14 and 18-karat finishes are mostly used on such articles as watch cases, chains and cheap jewelry, known as rolled or filled gold and sometimes by manufacturers of 8 and 10-karat gold jewelry, to give their articles a 14-karat appearance. The solution used for this purpose is made as follows:

Bring 3½ pints of clean water to a boil and add to it ¼ oz. carbonate of copper, 3 ozs. C. P. cyanide of potassium, 6 ozs. "fine gold solution" and 5 grams of bi-sulphite of sodium, and when all is dissolved replace sufficient water to make 1 quart. This solution is termed the "14-karat solution" and should be used at from 150 degs. to 160 degs. Fahr.

Articles of 8 and 10-karat jewelry, which are to be given a 14-karat appearance, should be cleaned in the same manner as articles to be finished in English gold, using the "14-karat solution" in place of the "finishing solution" and following the same process. Such articles as are made of filled or rolled gold, should after polishing be rinsed in the lye solution, immersed in the cyanide wash, rinsed and then scratch-

brushed with a small, worn-down brush. They are then plated in the following solution until the desired amount of gold is deposited, which usually takes about 10 to 15 minutes plating:

Dissolve in 3½ pints of water 5 ozs. C. P. cyanide of potassium, 1 oz. of carbonate of copper, after which add ½ oz. ferro-cyanide of potassium and 1 oz. carbonate of sodium. Allow this to dissolve and add 12 ozs. of "fine gold solution." Use this at from 100 degs. to 125 degs. Fahr.

After having been given a sufficient deposit the articles should be rinsed and scratch-brushed as before, then dried in sawdust and roughed lightly on a small soft buff to a high polish, or they may be burnished, after which they are put through the same process as mentioned above for 8 and 10-karat jewelry. An 18-karat finish can be obtained with a 14-karat solution by adding a slight excess of "fine gold solution," which will make it a little more yellow and give the 18-karat effect. It is advisable for the operator to dissolve separately 1 oz. of carbonate of copper and 3 ozs. of C. P. cyanide of potassium in 1 quart of water and place this in a bottle labeled "copper solution," and then if the 14-karat solution works too yellow, add a little copper solution at a time and if too reddish add a little "fine gold solution" at a time until desired shade is obtained.

As I have now placed before the reader the formulas, processes and methods of obtaining the "electro-deposited gold finishes" that are most desirious to the jewelers of today, I shall conclude this article with

"A FEW POINTERS TO THE GILDER."

The author desires to draw the attention of the operator to such details that require his attention and are necessary to do good work, and will mention them in the order of their respective importance.

1. CLEANLINESS.—It is of vital importance to keep the gilding bench and solutions as clean as possible, also the bowls, dishes, pans, and, in fact, all paraphernalia connected with the "gilding room."

2. CONNECTIONS.—Be sure all wire connections are tight and firmly attached, as otherwise current is lost; also care should be taken not to form a "short circuit," that is, to allow the positive and negative poles to touch each other, and in working the solutions, do not allow the anode to come in contact with the articles plated, as it sometimes injures and spoils the article.

3. When making solutions, always be sure to use the right chemical and correct weight.

4. Always handle chemicals carefully, and wash hands after handling, as some give painful, though not injurious sores.

5. If a batch of work is to be finished in different colors, get all of each color in a separate batch and finish one lot at a time.

6. It is well to keep solutions not in use in glass bottles, to keep them free from dirt, labeling each bottle for its respective solution.

7. In scratch-brushing always take pains to brush the article carefully, so as to cleanse it thoroughly and make the surface uniform and even, as this helps to beautify the finish.

8. The same can be said about the sandblasting operation.

9. Never take the rinse water used at one solution and use it at another, for if articles are rinsed and put back into the bath it may injure it.

10. Never omit an operation, as each one helps to beautify the finish.

(This series of articles will be published shortly in book form.—ED.)

BRASS COVERING FOR IRON AND STEEL.

The strides which have been made in the motor industry within the last few years, and the keen competition there is between the manufacturers, has made it expedient to use to a greater extent iron and steel parts provided with a bright brass covering in places where formerly less substantial brass parts had been used. According to the German "Metal Industrie Zeitung" great attention is being paid to this branch of the metal trade.

Thin brass coverings as deposited by the ordinary means of galvanizing, are worse than useless, as such articles, which are constantly subjected to rubbing and cleaning, will soon be scoured through the thin covering and expose the iron. According to our contemporary, the brass covering should not be less than one-fifth millimeter, and this is a thickness of deposit which cannot, we believe, be produced by ordinary means, as if it is attempted to do so, it will be found that even after an immersion of several hours in the bath the deposit is so thin that it will not stand much polishing. It will further be found that the brass deposit has a tendency to blister, with the result that in polishing, these small protuberances are scoured through quicker than the rest, which makes the articles so treated useless.

These difficulties are enhanced when it is attempted to cover cast iron with brass of a thickness which will make them serviceable, as the more porous nature of the cast iron permits small particles of the alkaline liquid of the bath to conceal themselves beneath the brass covering, with the result that the iron corrodes, and this corrosion breaks through the brass covering leaving ugly brown marks. The most careful washing and drying, and even treatment with acids to neutralize the alkaloids, are not able to prevent this formation of marks.

In order to obtain a serviceable brass deposit of sufficient thickness on cast iron, it is, in the first place, necessary to cover the iron with a metal covering of greater density, and for this copper is most useful, but in order to get a satisfactory copper deposit it is best to apply a primary nickel covering.

The following is a more precise description of the process. The parts to be treated must be ground and polished and perfectly free from oil and thoroughly rinsed in water. Then a thin nickel deposit is given in the usual way. After rinsing again, the pieces are put into an acid copper bath, under a current of 1 volt, for one hour. Should the castings be very porous, it is better to give them rather longer treatment. After carefully rinsing in running water, and any roughness in the copper deposit has been removed by means of emery paper or the polishing machine, the articles are put into the brass bath for their final covering. It will be found that the copper coat will carry a much thicker brass covering, which adheres well.

TREATMENT OF COPPER RESIDUUM BY A NEW PROCESS

United States Consul-General Henry W. Diederich, of Antwerp, reports concerning a new process for the treatment of copper residuum, and obtaining therefrom copper in the form of cement or precipitate of copper, sulphate of ferromanganese, and subsidiarily granulated brass or bronze. It is said that by no other process can manganese as a fertilizer be produced to compete with this new process, although the proprietors are not pushing in this connection, confining themselves largely to the manufacture of sulphate of iron as a by-product from copper ashes, waste, etc. The consul-general's detailed report in regard to this process may be seen in the Bureau of Manufactures, Washington, D. C.

THE DETERMINATION OF LEAD IN NON-FERROUS ALLOYS*

By C. P. Karr.†

C. P. KARR.

The use of lead in the foundry goes back to the remotest period of human industry. Its general properties are well known, and when by intent or carelessness they are violated, the founder soon discovers his mistake without much difficulty; its application within very narrow limits is well understood by all practical metal workers. So important a factor has lead become in every foundry where a diversified range of castings is made that it has been deemed necessary to determine the percentage of that element in any form of alloy in which lead may be present. To accomplish this end chemists have made exhaustive researches to discover assay methods that should be accurate, easily conducted and conclusive. In this paper the methods of assay referred to apply to the alloys into which lead enters in the course of foundry practice rather than to the ores in which lead occurs.

GRAVIMETRIC METHODS.

Alloys not containing tin may be proceeded with directly for the determination of lead, but if tin be present the alloy is dissolved in nitric acid, evaporated to dryness on the water-bath diluted, allowed to settle, filtered and the filtrate treated with two to three ccm of sulphuric acid, evaporated until fumes of sulphuric anhydride are driven off, cooled, diluted with 20 to 30 ccm of water, washed with diluted sulphuric acid, or alcohol, or both, dried in the steam bath, precipitate detached from the filter, the paper and the precipitate ignited separately, their ashes united, a drop of nitro-sulphuric acid added, gently dried and reignited and weighed as lead sulphate, or the precipitate is filtered through a Gooch crucible and dried at 105 per cent. to constant weight.

This method is very old, but is reliable only in the most skillful hands. In the incineration of the paper filter there are two sources of loss, the oxidation and volatilzation of lead and the difficulty of reconverting every particle of the lead reduced by the carbon of the filter back to the form of a sulphate. To overcome these difficulties the Gooch crucible is resorted to. Dr. Bollenbach (Zts f. anal Chem. 1908 P. 690) states, however, that this sulphate reaction is not very convincing because the precipitate is soluble in strong nitric acid, and he proposed the precipitation of lead as a peroxide in an ammoniacal solution by means of bismuth and gives his method in detail. In his paper on the volumetric assay of lead Dr. J. F. Sacher (Chem. Ztg. Dec. 2, 1909, p. 1257) states that the precipitation of lead as lead molybdate offers an advantage over that of the sulphate method, as the salt is less soluble in water than the sulphate. In a nitrate solution of an alloy not containing arsenic, arsenates nor phosphoric acid, ammonium molybdate may be used directly as a reagent for the quantitative separation of lead. Jannasch (Ber. 26, 2329 and 2331) has proposed a gravimetric separation of lead and copper from a nitrate solution by means of the hydrogen peroxide method, of lead from tin and zinc, metals which are of vital importance, and while these methods are of great importance to the research chemists, they are, on account of the difficulties incurred in the ignition for weighing of limited use in the every-day routine of the foundry.

VOLUMETRIC METHODS.

Numerous methods have been proposed for this determination; the three most prominent are Alexander's molybdic acid method, as modified by Low; the ferror-cyanide method and the permanganate method.

Alexander's original paper was first published in Berg-u-Huttenm, Ztg., 1893, p. 201. Low's modification in Jour. Amer. Chem. Soc. col. 15, p. 550. He employs a solution of 4.25 grams of the salt to the liter, which, if ½ gram be weighed out for the assay corresponds one ccm to 1 per cent. of lead. Dissolve 0.2 grams of pure lead in nitric acid, evaporate with sulphuric acid, filter off the lead sulphate and wash with dilute sulphuric acid. The sulphate is decomposed with 25 ccm strong hydrochloric, add 15 ccm hydrochloric acid and 25 ccm water and saturate with 25 ccm strong ammonia (sp. gr. 0.90). Finally acidify with strong acetic acid, dilute with 200 ccm of water, heat to ebullition and titrate.

The ferro-cyanide method is carried out with a lead acetate solution acidified with acetic acid and titrated with a ferro-cyanide solution which contains 10 grams of this salt to the liter, one ccm of solution for one gram assay corresponds to about 1 per cent. of lead. Titrate till a drop taken out with a drop of saturated uranium acetate solution gives a characteristic brown coloring upon a porcelain plate. Low digests the lead sulphate with saturated ammonium carbonate solution to convert the sulphate into a carbonate, cools, filters and dissolves the carbonate in a mixture of 5 ccm concentrated acetic acid and 25 ccm water, dilutes with 100 ccm water and titrates. If antimony bismuth are present then the lead sulphate is first of all treated with 10 ccm sulphuric acid (1;1) and 2 grams of Rochelle salts, add 40 ccm water and boil. Dr. Bollenbach's method is a modification of the permanganate method (Zts. f. Anal. Chem., 1907, p. 582), but his method is a reversal of all former procedure. In a hot solution of potassium permanganate he adds the lead solution, made alkaline by sodium hydrate, drop by drop, to complete discoloration; adds some barium sulphate to facilitate the titration, but his method has recently been studied by Dr. J. F. Sacher, who states that the behavior of barium sulphate towards potassium permanganate is completely indifferent, and that the method proposed is unreliable.

Dr. Sacher advocates the adoption of the molybdate method (Chem. Ztg. Dec. 2, 1909, p. 1257), which he modifies as follows: To conduct the titration there is required an ammonium molybdate solution of which one ccm corresponds to 0.01 lead and a 3 per cent. tannin solution. In adding there should be a lead nitrate solution containing 16 grams of lead nitrate in water to the liter of which one ccm corresponds exactly to 0.01 gram of lead, and ready for the back titration when necessary. With this solution the rest of the molybdate titration may be quickly controlled. The tannin solution must be freshly prepared, as it is not unalterable; a 2

*Abstract of a paper read at American Foundrymen's Convention, Detroit, Mich., June 6-10, 1910.

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per cent. addition of acetic acid will prolong its sensitiveness toward the molybdate solution for one week; alcoholic tannin is more permanent and is suitable as an indicator.

Applied to a bronze alloy, for example, the procedure would be to dissolve about 0.5 grams in from 4 to 5 ccm of nitric acid (sp. gr. 1.42) evaporate to dryness, dilute with water in the usual way, filter off the metastannic acid, precipitate the copper with the electric current, or as a sulpho-cyanate, and determine the lead in the filtrate from the neutralized solution. Add 5 ccm ammonia, dilute to 100 ccm with hot water, allow to stand on water bath two to three minutes, add 5 ccm of 80 per cent. acetic acid and titrate hot with ammonium molybdate. The volume of the titrated fluid is carefully measured and the excess in molybdate corresponding to this volume, which occasioned the first yellow coloring with the tannin solution is deducted from the ccm of molybdate solution found. A concentration below 0.15 per cent. lead is to be avoided, because such a condition makes the end point indistinct.

In such a case the colorimetric method is preferable. The best results are obtained if the precipitate is allowed to settle on the water bath from two to three hours. To be filtered cold, wash with water till the filtrate shows no more turbidity with the neutral lead solution, dry at 100 degs. Cent., ignite gently after separate incineration of the filter and weight after cooling as $PbMoO_4$. A large percentage of iron in the alloy interferes with an accurate result. This may be avoided by precipitating the excess of iron as a hydroxide in the presence of acetic acid.

A new and simple volumetric method has recently been proposed by Dr. Rupp (Chem. Ztg., Feb. 8, 1910, P. 121) as follows: 20 or 25 ccm of a half-normal solution of potassium cyanide is rinsed into a 100 ccm flask, mixed with a suitable volume of lead solution (1 to 5 per cent.) free from acid. Fill up to the mark, mix thoroughly, filter after five to ten minutes and titrate 50 to 75 ccm of the filtrate with ¼ to ½ normal acid to determine the excess of alkaline cyanide. Use methyl orange as an indicator. If the lead salt solution contains any acid in a free state it is made exactly neutral with dilute NaOH in presence of methyl orange. The foundation equation is $2Cy' + Pb'' = Pb'' Cy2$.

CENTRIFUGIC METHOD.

In the Chemiker Zeitung Repertorium of Feb. 13, 1909, there was published an account of the Centrifugic Method used successfully by an Italian chemist in the works of Ansaldo Armstrong & Co., in Corningliano, Liguria. According to the supposed lead constituent he weighs out from 0.5 to 5 grams of the alloy to be tested, treat with nitric acid in the same way as in a solution for the determination of lead sulphate, filter off the meta-stannic acid, evaporate the filtrate with sulphuric acid until white fumes appear, cool, dilute with 20 ccm of water. Use a centrifugal apparatus. The tubes used are granulated somewhat similar to that of a burette. A certain factor dependent upon the weight taken is used in obtaining results. If two grams, for example, have been weighed out and the tube reading is at the twelfth division, then by multiplying this reading by the factor 0.2274 the lead content becomes 2.728 per cent of lead.

Frank Castek (Osterr. Zts. Berg-u-Huttenm, 1909, vol. 57, pp. 665 to 684) used a phosphorous centrifuge machine and prefers the ammonium molybdate precipitation of lead to that of the sulphate. His conclusion is that applied to ore containing less than 35 per cent., using one gram for a determination, the results are concordant but somewhat too high. Fourteen tests could be made in five hours.

THE PLANIMETRIC METHOD.

This method of assay of lead in non-ferrous alloys may safely be described as the latest to arrive among us. It is essentially a microphotographic method. In a non-ferrous alloy containing many ingredients it would be necessary to eliminate tin, copper, antimony and arsenic in the usual manner and reduce the alloy if possible to such a state as to contain but two metallic ingredients, preferably zinc and lead. Obtain a sulphate solution, evaporate to dryness until fumes of sulphuric anhydride escape, and transfer the same to a porcelain crucible, reduce and ignite to a prill or button of lead, allow to cool, remove the prill, flatten carefully and etch with dilute nitric or sulpho-cyanic acid and take an enlarged microphotograph of the same.

Prepare several standard microphotographs of lead-zinc alloys or lead alone, or lead and tin, or lead and copper, or lead and antimony, or lead and arsenic with the planimeter in the usual way; measure the lead area shown by the microphotograph and by the method of proportion compare the areas of lead in the unknown compound with the areas of the known compound. To any one familiar with operating a planimeter the method becomes exceedingly fascinating, and if the buttons or perils of a known composition are carefully prepared and clearly photographed to scale, the results are accurate and conclusive. The percentage composition is arrived at in the usual way, namely, the proportional area of the known composition is to the percentage of the ingredient known as the proportional area of the required ingredient measured by the planimeter is to its required percentage composition.

ELECTROLYTIC METHOD.

Lead is deposited from a strong nitric acid solution at the anode as lead dioxide. To facilitate the deposition, the anode should revolve about 500 revolutions per minutes. The current density should be about five amperes, and the terminal pressure between three and four volts after ten minutes interrup the current for some seconds in order to accelerate the reduction of the metallic lead, separating at the anode, and repeat this once again towards the close of the assay. After thirty minutes test the solution for lead with ammonium sulphide. When the work is finished, shut off the current, dip the anode wire or gauze in hot water and then in alcohol, and dry for an hour at 230 degs. and weigh. The weight of the lead dioxide found multiplied by 0.866, according to H. J. S. Sand and E. F. Smith, by 0.8643, according to A. Stahler, but by 0.857, according to Hollard and Bertiaux. This discrepancy is due to differences of the thoroughness in the expulsion of the water from the deposit. The question has been carefully studied by H. J. S. Sand. He dried the deposits in a specially contrived drying oven where he could maintain a temperature almost constant between 230 and 240 degs. Cent. It is my conviction that this empirical factor must be established by a series of experiments that apply to the oven itself, and the conditions under which the assay is conducted. By igniting the lead dioxide to lead oxide, as suggested by Treadwell, which can be done if a platinum dish be used as the anode, this difficulty of drying at a constant temperature may be overcome, and with more accurate results. In conclusion the writer would say that the last method is the best of all for rapid, accurate work.

THE ZINC CONVENTION IN GERMANY.

The purpose of the convention is to fix beforehand, within certain limits, the production of spelter by its members, the output to be governed by the market.

BRONZE MEMORIAL TABLET AND GROUP DEDICATED IN MASSACHUSETTS.

A bronze tablet as here reproduced was dedicated at the commencement exercises of Harvard University, held in Cambridge, Mass., June, 1910. This tablet was designed and executed in bronze by Bela L. Pratt, the celebrated sculptor of Boston, Mass., and commemorates the Harvard men who died during the Spanish-American war.

The details of the tablet are as follows:

The tablet is 8 feet long and about 4½ feet wide, and represents an eagle with outstretched wings, beneath which on either side are engraved the names of the following men who died: Oliver Bridges Henshaw, '93; Philip Ashley Crapo, L. S., '94; Stanley Hollister, '97; William Huntington Sanders, '97; William Ariel Talcott, L. S., '97; James Thwing Furness, '98; Roy Walter Stover, '98; Stuart Wadsworth Wheeler, '98; Nathaniel Brown Adsit, '00; Ralph Ward Lahman, '00; Sherman Hoar, '02.

BRONZE MEMORIAL TABLET TO HARVARD SPANISH-AMERICAN WAR MARTYRS.

Directly beneath the talons of the eagle are the words "Spanish War, 1908," with the "Veritas" scroll. Encircling the body of the eagle is an enormous wreath of leaves, while the huge wings of the bird sweeping out on either side overtop the two tablets bearing the list of names.

Another production of Mr. Pratt's, a bronze group commemorative of the army nurses and soldiers, has already been completed in model form, and is to be cast in bronze and placed in position upon a site in Boston, Mass., not yet definitely decided upon. Several sites, however, have been mentioned for this statue, which represents a nurse in the act of giving a cup of water to a wounded soldier, and the location now most prominently suggested is one at the end of one of the streets leading from Beacon street into the Charles river parkway.

The group is of such a height that it will not obstruct the view of the river, and moreover has a setting which will greatly add to its attractiveness.

The whole is about 8 feet high, the pedestal of granite standing about 4 feet. Around this central piece is arranged a spacious quadrangular inclosure, walled on three sides with a balustrade, and containing at either end a wide seat. This inclosure, planned by C. Howard Walker, gives to the group that distinctive and individualistic effect which so often sets a group apart from its surroundings and enhances its artistic attractiveness.

PUBLIC HEALTH PRECAUTIONS IN THE ARGENTINE REPUBLIC.

The Argentine Government has decreed that all tins for foodstuffs will be considered dangerous to the public health, if they contain more than 1 per cent. of lead or other toxical metals, such as zinc, antimony and arsenic.

MANUFACTURE OF SHOT.*

BRISTOL HAS THE OLDEST TOWER IN THE WORLD.

The following information concerning the English development of the manufacture of shot is furnished by United States Consul Homer M. Byington, of Bristol:

The erection of the Bristol tower for shot making is credited to William Watts, plumber, in 1769. It was "built" by sawing a square hole in the center of the various floors of his house, and locating the well in the cellar. This tower is still in use, although it has been heightened by the addition of some stories. Watts secured a patent on Dec. 2, 1782, and sold his London rights in 1800 for £10,000 ($48,665).

The lead from which the shot is made is smelted by the present company, and poisoned by their secret process, at their establishment. When molten it is poured into a sieve-like receptacle at the top of the tower and these molten drops, falling into a well, 120 feet below, form the shot, which are then passed through a polishing grader. They are then spilled from a hopper onto an inclined plane; the perfect shot run onto a second plane, while the imperfect drop into the opening between. The shot pass over four series of planes and only the perfect reach the last plane, whence they are weighed into sacks and sewed up, by a Singer cord-sewing machine, ready for the market.

The tower being only 120 feet in height, a larger size than BBB can not be manufactured by this process. The larger shot, including shrapnel for the British Government, are prepared in two different ways. For the medium size shot a wire of the proper material is fed into a machine which, simultaneously, mashes it into a ribbon shape and punches irregular formed shot. The largest shot are made by pouring the molten metal substance into long bullet molds, which cooling, form irregular shot. The various sizes are then placed each by themselves in gins which are revolved for six hours, when the shot come out perfectly smooth spheres.

The power for the plant is furnished by a gas engine, and the machinery is all British, with the exception of the cording machine mentioned.

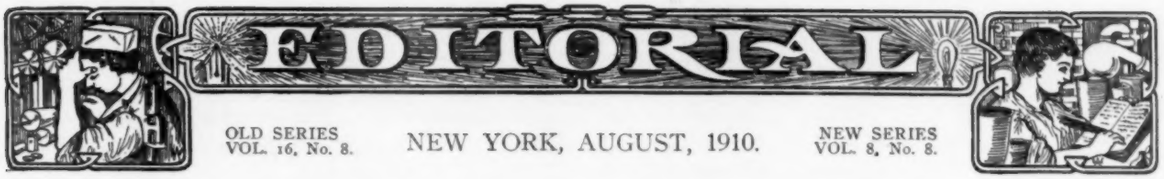
TANTALUM DENTAL INSTRUMENTS.

ADVANTAGES, INCLUDING LOWER PRICES, CLAIMED THEREFOR.

United States Deputy Consul-General Archibald B. Dorman furnishes the following information concerning the manufacture of tantalum dental instruments, recently established in Berlin:

Many advantages, besides lower prices, are claimed for tantalum dental instruments over the steel instruments, which they are intended to supersede, viz., hardness; freedom from effects of bases and acids, except fluoric acid; and capacity to withstand a temperature of more than 400 degs. Cent. American dentists say that the tantalum instruments do not rust when left exposed to the air, but retain their polished surfaces, besides proving more lasting than the steel instruments. They can be cleaned by being washed in soda and disinfected by being boiled in water containing soda. In working with phosphate and silica cements and amalgams, tantalum instruments have special advantages; they are not affected by iodine, etc. They may be used, in working root canals, with trikreosol acids, where steel cannot be used.

*THE METAL INDUSTRY, January and March, 1910, contained articles on Shot Manufacture in the United States and Mexico.



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THE METAL INDUSTRY

THE CONSOLIDATION OF

THE ALUMINUM WORLD

THE BRASS FOUNDER AND FINISHER

ELECTRO-PLATERS' REVIEW

COPPER AND BRASS

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CONTENTS

	PAGE.
The Commercial Uses of Silver	329
The Scleroscope	332
A Short Account of the Birmingham Brass Trade	335
The Manufacture of Wrought Brass (Continued)	342
The Practical Electro-Deposition of Gold (Concluded)	344
Brass Covering for Iron and Steel	345
Treatment of Copper Residuum by a New Process	345
The Determination of Lead in Non-Ferrous Alloys	346
Bronze Memorial Tablet and Group Dedicated in Massachusetts	348
Manufacture of Shot	348
Tantalum Dental Instruments	348
Editorial:	
The Restriction of Copper Production	349
Criticism and Comment:	
New Books:	
Metallography—Cecil H. Desch	350
The Journal of the Institute of Metals—Scott	350
Zink, Zinn und Blei Chemisch-Technische Bibliothek-Richter	351
A Pathfinder	351
The Analysis of Brass	351
Position of Workmen in Polishing	351
Shop Problems	352
Patents	354
Industrial:	
The Globe-Abbot Tumbling Barrel for Burnishing with Steel Balls	356
No. 1 Automatic Screw Slotter	356
"Cupror" a New Metal	357
Bradley Process for Rust Proofing	358
Dings Magnetic Separator with Direct Connected Dynamo	358
Flake Graphite as a Lubricating Factor	358
Correspondence	359
Associations and Societies	361
Personals	362
Trade News	363
Metal Market Review	366
Metal Prices	367

THE RESTRICTION OF COPPER PRODUCTION.

Judging from reports emanating both at home and abroad from what may be taken as authoritative sources, plans have been definitely formulated looking to a restriction in the production of copper. Just what shape these plans will finally assume, whether a "gentlemen's agreement" or a combination of leading interests that will be kept just inside the confines of the Sherman Anti-Trust Law, it is impossible at this writing to state. Undoubtedly fear of governmental interference has retarded plans that were entered upon a number of months ago. In the meantime conditions in business generally have not improved commensurate with the promises of the first of the year. Copper producers have with possibly one or two exceptions continued to put in force plans for increased production. Mines and smelters have been run on full capacity, the Calumet and Hecla Mining Company being one important exception in that its plants are operating at only 85 per cent. of their capacity.

Consumers of copper having in mind previous experiences have been buying only for immediate use and consequently production has run ahead of consumption until the figures for July show 170,640,678 pounds of copper on hand which is even larger than the amount shown by those for June. The only relief from such a remarkable condition of affairs is in the restriction of production until demand catches up or equals the supply. Buyers will certainly not, as has been conclusively proved, jump at temptingly low prices, until they are assured of definite basis for future prices. Low record prices have been made in all classes of copper both in the United States and England, the price in the latter country being the lowest reached in seven years, and even these low prices have not stimulated a market already overloaded with supplies.

If some means of curtailing the production of raw copper are not devised and carried out in the near future, the copper trade, and with it the brass business, will be in a state of chaos bordering on demoralization. The situation at present writing is critical and were it not for the cheering news that leading interests had formulated an agreement, one would be tempted to say that the brass business would soon be plunged into a period of stagnation.

The recent sale of upwards of 35,000,000 pounds of copper by The United Metals Selling Company and 15,000,000 by other interests at practically 12½ cents per pound proves that consumers are somewhat assured that curtailment of production is certain and that the price will be stimulated. Inquiry among some of the

prominent selling agents elicits the opinion that 15 to 16 cent copper may be looked for shortly, provided the restrictive production plans are carried out. It is anticipated that the amount of curtailment in production for the next three months will be at least 25 per cent. and 10 per cent. for the following six months. No actual facts can be obtained from the producers regarding the details, so only conclusions can be drawn from observing the stiffening of prices and the condition of copper stocks on the exchanges and these conclusions must also be based upon the amount of copper shown to be on hand by the monthly production of figures.

Just what effect a 25 per cent. reduction by the larger producers for the next three months will have on the smaller and independent producer is problematical. With a higher price for copper, say 15 cents per pound, small producers will certainly be stimulated to further exertion to get out the metal and reap the benefit. Whether those outside could come anywhere near taking care of the reduction made by the larger producers and so even things up again is extremely doubtful, but it is certain that more propositions could be worked at 15 cents than at 12 cents. On the other hand the amount of copper imported into the United States need not be considered any cause for anxiety that restrictive measures could not be carried out. The shipments of African ores received at Perth Amboy are nothing new within the last four or five years and they do not embrace all told an extensive amount in weight of copper, the ores running only about 10 per cent. of copper and considerable lead, are a difficult proposition to smelt.

It will be a few years yet before any great amount of copper is brought from Africa to the United States. A railroad, it is true, is now being built to the copper district in southern Africa exploited by the late King Leopold, of Belgium. The Belgium syndicate will probably consume the greater portion of the supply after it becomes available, so it will be a number of years before we can expect to see much copper coming from Africa.

The Alaskan properties are in much the same position, and it will be four or five years before copper ore is brought to the United States from this source. Perhaps by that time consumption already stimulated by the marvelously growing automobile and electrical business will have so grown as to have equaled the supply, and we shall be glad to look to the foreign countries for copper and restriction of output will be ancient history.

It has been remarked that inasmuch as 128,000 tons of copper have been sent out of the United States during the first six months of this year that it was not all for consumption, but would be kept in storage for a raise in prices. This assumption is based on the fact that copper is quoted in London at a less price than in New York. It must be remembered, however, that the copper exported is refined electrolytic and the copper quoted in London is known as Standard copper, which does not include refined brands. In order to bring the quoted copper up to the standard of that exported such an amount must be added to the price of London Standard copper as to make it actually higher in price, so this contention falls to the ground, and it is safe to say that all the copper now being exported is for consumption purposes only.

CRITICISM AND COMMENT
WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY. SUGGESTIONS WELCOME.

NEW BOOKS

"METALLOGRAPHY." By Cecil H. Desch, Graham Young Lecturer in Metallurgical Chemistry in the University of Glasgow. Edited by Sir William Ramsay, K.C.B., F.R.S. Size 5¼ by 7½ inches; 432 pages; 14 plates and 108 diagrams. Longmans, Green & Co., New York, N. Y.

The author in giving his reasons for preparing the book says: "The study of metallic alloys by physical and microscopic methods has reached so great a development in recent years as to form a distinct branch of physical chemistry. In the following pages I have sought to present an account of the methods employed in this branch of study and of the conclusions which have been reached, and also to indicate the directions in which further research is needed." The opening chapter of the book, which is really the best treatise on the subject that we have so far seen, gives the following definition of metallography: "The study of the internal structure of metals and alloys, and of its relation to their physical and mechanical properties."

The book consists of eighteen chapters and an appendix, which give a remarkably clear and able presentation of this difficult and little understood subject. The first four chapters of the book are given up to the Diagram of Thermal Equilibrium, and give an extremely able and lucid discussion of this phase of the subject. The chapter seven, devoted to the preparation of micro sections, is especially interesting and valuable, and this, coupled with chapter eight, in the examination of prepared sections, makes it possible for the metallographic student to pursue the study of the non-ferrous alloys by the aid of the microscope with intelligence and success. On the whole, the book makes a most welcome addition to a scientific library, and certainly should be in the possession of every metallurgist.

"THE JOURNAL OF THE INSTITUTE OF METALS." Volume III. Edited by G. Shaw Scott, M. Sc., Secretary. Size, 5½ x 8¼ inches; 360 pages; 14 illustrations. Published by the Institute of Metals, Caxton House, London, England.

The Institute of Metals has just published the third volume of its Proceedings, with a steel engraving frontispiece of the president of the Institute, Sir Gerard Muntz, Bart. The major portion of the Journal consists of a series of papers of scientific interest, which were read at the annual general meeting of the Institute held in London in January, and covers 230 pages. Valuable though these papers were when they were read, their utility is now vastly increased as a result of written communications which have been received since the papers were read by men eminent in the scientific and metal-working worlds.

The useful series of abstracts of papers relating to the non-ferrous metals and the industries connected therewith which

was commended in the second volume of the Journal has been continued and amplified in the volume under notice, and there are now forty-eight pages devoted to abstracts on such subjects as Ores and Minerals, Extraction of Metals, Electro-Metallurgy, The Properties of Metals and Alloys, Analysis, Testing and Temperature Measurement, Statistics, and Bibliography.

In view of the fact that the Institute is about to become an incorporated institution, the concluding section of the Journal is appropriately devoted to the new memorandum and articles of association; there also appears a list of members of the Institute, which, compared with the list contained in the first volume of the Journal, published just a year ago, serves to show the extremely rapid strides that are being made by this, the youngest, and perhaps the most vigorous, of our scientific institutions. The Journal is issued twice yearly, in June and December, respectively, and is published by the Institute. All members of the Institute receive cloth-bound copies of the Journal gratuitously, but copies can be purchased for one guinea each from the offices of the Institute, Caxton House, Westminster, S. W.

ZINK, ZINN UND BLEI (ZINC, TIN AND LEAD) CHEMISCH - TECHNISCHE BIBLIOTHEK. Band (No.) 109. By Karl Richter. Second Edition. Size, 5½ x 7½ inches; 248 pages; 17 illustrations. Price, 3.25 marks ($1.00). A. Hartleben, Vienna and Leipzig.

This little book, published in German, contains a detailed description of the properties of these metals, their alloys with one another and with other metals. It states that among the impurities of commercial zinc are found such metals as lead, cadmium, iron, copper, antimony, tin and zinc oxide, and also arsenic, carbon and sulphur. In the zinc produced from blende the lead constituent varies from 0.3 to 3 per cent. With 1½ per cent of lead, zinc can still be rolled without cracks, showing on the edges of the plate, but increase this amount and it becomes difficult to roll the zinc plate without flaws, even up to 3 per cent. it is not impossible to roll such zinc by very skillful guidance, but the plate will be brittle, and with difficulty will bear bending.

From 0.05 to 1.64 per cent. of iron increases the hardness of zinc and renders the rolling difficult. When such zinc is employed for galvanizing purposes the presence of iron makes the zinc more susceptible to the attack of weak acids or acid vapors. Where both iron and lead occur as impurities the zinc is not only hardened and made more brittle, but the difficulty of working increases.

It is known that zinc objects may be given a permanent black color; one of Böttger's methods is cited: If a zinc object is dipped into a fluid consisting of 64 parts of water, two of copper nitrate, two of copper chloride, and eight of hydrochloric acid (spec. gr. 1.1), then the zinc surface takes on a uniform black color which, after strong heating, does not disappear.

Among the alloys mentioned are those of the so-called Vienna bronze, consisting of copper 63.66 to 72.5; zinc 33.59 to 23.00; tin, 2.50 to 2.00; and lead, 0.25 to 2.50. The so-called pure tin foil used for packing tea in chests is stated to contain:

Tin	97.0	90.0	92.0
Lead	2.5	7.8	7.0
Copper	0.5	0.2	1.0

which shows a wide variation in constituents other than tin itself. An interesting alloy, from which the theatrical jewels, finery and ornaments are made, is stated to consist of lead 19 parts and tin 29 parts; when pulverized the fine particles have a glittering luster. Although this little work omits any reference to the process of "Sherardizing," it mentions two processes which produce similar effects, but probably not the like durability.

In the process of tinning over the surface of another metal, it refers to the so-called "rubbing" process. A delicate but not very durable coating of tin or zinc may be produced in this way: Heat two parts of the finest pulverized argols and one part of tin chloride with four parts of water, and add as much sea sand as will produce a thin paste or pulp, which, by means of a brush or sponge, is rubbed upon the zinc object, which has previously been heated from 40 to 50 degs. Cent. After the tin coating has formed, the luster is applied by rubbing the surface with aluminous sand, wash these particles off, and finally rub with a woolen cloth until a high luster is attained.

Under the heading of the working of zinc, it is stated that a brass coating can be put on a zinc surface if a solution of copper vitriol and zinc vitriol are mixed with a potassium cyanide solution, till the precipitate is dissolved anew and add 10 to 20 per cent. of ammonia. The more the zinc vitriol predominates the brighter is the color of the brass deposit. The book abounds in practical directions as to manipulations and lays bare many so-called trade secrets in the founding and manufacture of alloys and the articles to which they are applied. For sale by THE METAL INDUSTRY.

A PATHFINDER.

A book of 143 pages, 7 x 10 ins., handsomely bound in unfinished leather, has been issued by the Acheson Graphite Company, Niagara Falls, N. Y. The book is the history of the life work of Dr. Edward G. Acheson and contains a steel engraving frontispiece of this famous inventor. There are fifteen chapters in the work, which are preceded by a preface and a dedication notice. Taking up the chapters and the subjects that they treat of in regular order, Dr. Acheson's career is most minutely described and the reader is enabled by a perusal of the work to learn how he came to give the world aquadag, oildag, carborundum, artificial graphite, and other valuable products of the electric furnace.

THE ANALYSIS OF BRASS.

TO THE EDITOR OF THE METAL INDUSTRY:

In the June issue of THE METAL INDUSTRY A. J. Hall in his article on "The Analysis of Brass" makes use of the potassium permanganate method to determine the amount of antimony in brass and alloys. The method for itself is comparatively accurate for commercial purposes and takes up less time than most of the methods for the same determination, but there is one drawback, namely, the end point of the reaction is very hard to distinguish, even for the experienced eye, as the pink color fades very rapidly ,and "the true end point under these circumstances is troublesome to find." (Law.)

To overcome this difficulty I would suggest to add to the antimony solution, immediately before titration, a certain amount, more or less, according to the quantity of hydrochloric acid used to convert the antimony and the lead into chlorides, of the so-called "titrating mixture" (made by dissolving in one liter of water about 45 gr. MnSO., 93 c.c. H. P. O. (85%) and 279 c.c. H_2SO_4), which is in common use in the determination of iron by the potassium permanganate method.

The addition of this mixture will help to make the reaction distinct and of such long durability, that the end point is unmistakable and so greatly increases the accuracy of the method.

J. ELKES.

Cleveland, Ohio, July 9, 1910.

POSITION OF WORKMAN IN POLISHING.

To the Editor of THE METAL INDUSTRY:

In the April METAL INDUSTRY, on page 174, I saw the article by Mr. F. H. Schutz, "Should a polisher sit or stand while working?" I think it could be answered in a few words. He doesn't specify what class of work is to be polished, but by his question I should judge it to be stove plate; if so he could do more work standing.

I am a foreman plater, with twenty years' experience, and in that time I have handled all kinds of polishing and workmen (some good and some bad); also classes of work as small as ⅛" x 1/16" to 5' x 2' x 2'. On some work I have had men that could do as much in one day, sitting on a stool, as others could do standing. It all depends on the class of workmen. Eighty per cent. of the work to be polished at the present time can be done faster while standing. I think Mr. Schutz's articles depends on what class of work he refers to for a proper answer.

C. L. PUFFER.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—Kindly let me have a mixture of aluminum that will cast well and stand a pressure of 100 pounds per square inch.

A.—The reason that castings made from aluminum alloys leak when under pressure is that the aluminum readily oxidizes and the oxide remaining dissolved in the metal causes leaks. There is an alloy on the market known as alloy No. 12 (aluminum 93, copper 7) which is claimed to be made in the electric furnace, and is presumably free from oxides. If you obtain virgin metal free from oxides and avoid overheating in melting, you may possibly obtain a casting that will hold the pressure you name.—J. L. J.

BRAZING

Q.—We should be glad to know the composition of a good brazing solder suitable for brazing the brass brake handles of automobiles?

A.—Castings that are to be brazed ought to be made from "brazing metal," viz.:

Copper	80
Zinc	20

If you have to match the yellow brass of the other fittings, in color, resort might be had to brass plating. The only low melting point brazing solder you could use would be silver solder, and it is very expensive.—J. L. J.

BRIGHTENING

Q.—Can you please tell us what chemical is used in tempering chisels to brighten (that is remove scale which forms after the chisel is put in water first time)? The object is to make a clean surface so the stage of the color changing can be watched more accurately?

A.—Coat the articles with a solution of sodium silicate. This should form a flux and prevent oxidation and yet dissolve easily when placed in the hardening water. Borax should answer the same purpose, but it is more difficult to remove.—C. H. P.

CASTING

Q.—Can you tell us if there is any way to prevent castings (copper 88, tin 12) from coming out porous on the bottom side?

A.—In copper and tin mixtures, like the one you mention, it is customary to add about two per cent. of zinc to act as a deoxidizer, and to thus produce sound castings. In melting the copper also care should be exercised to avoid overheating, and it should not be allowed to soak in the fire before adding the tin.—J. L. J.

Q.—What is the best way to produce a casting with a good color, straight from the sand, such as American valves? The castings I make have a black appearance rather than a nice brass appearance.

A.—If your castings show a black surface the brass used must contain considerable iron. Many shops make American valves from the following mixture:

Copper	87
Tin	7
Lead	2
Zinc	4

This metal has a good red color and machines well.—J. L. J.

CLEANING

Q.—Can you give me a formula for an electric cleaning solution (without cyanide of potash) to be used on brass and copper?

A.—For an electric cleaner without the use of cyanide of potash try the following:

Caustic soda	1 lb.
Sal soda	1½ lbs.
Water	1 gal.

Use the solution hot, preferably in an iron tank, which should be connected to the positive pole. If a wooden tank is used, use anodes of sheet iron and a voltage of not less than 6 should be used in connection with the cleaner.—C. H. P.

COLORING

Q.—Kindly state through the Shop Problems column of your paper what kind of coloring to use to obtain the different shades on verde antique work.

A.—The various shades noted upon verde antique are due to the application of dry colors moistened with turpentine and linseed oil to which is added a very small amount of hard oil finish varnish or turpentine varnish. The colors used are light, medium and dark chrome greens, orange and yellow chrome, soluble blue, zinc white and refined lampblack. A comparatively dry brush is used, and only a very small amount of the color is necessary to tone the surface. The motion should be to and fro. It can be readily seen from combination of the above colors any tone can be produced that will contrast with the verde antique background. The best results are obtained when the surface is previously lacquered. After the toning colors are thoroughly dry, the articles should be waxed in the usual manner. This will give the opaque metallic lustre so much admired.—C. H. P.

DIPPING

Q.—Will you please publish a formula for a Venetian bronze dip, such as used on casket hardware?

A.—The Venetian bronze, as you term it, is oftentimes called casket hardware green and is used in the place of French grey or oxidized silver.

To prepare this finish prepare a solution of 2 ozs. of liver of sulphur and ¼ oz. of ammonia to each gallon of water and use the solution slightly warm. The best results are produced when the silver surface is dead white so in connection with this finish bisulphate of carbon should not be used in the silver solution. When immersing in the oxidizing dip the articles should be lifted out of the solution at each immersion to note the color. The first tone if yellow, then purplish brown, then grayish, finally the green develops. The articles should then be rinsed in cold water as rapidly as possible. When drying out it is advisable to use the water only fairly warm as a boiling water oftentimes darkens the tone. The articles are relieved in the usual manner and then lacquered.—C. H. P.

ETCHING

Q.—Will you please advise us how etching on brass is done by using tinfoil to cover that part which is not to be etched? What is the black color to be used to fill in letters on a sign, and how is it applied?

A.—Tinfoil is used in etching to prepare stencils of the design to be etched, and the resist is then painted over the stencil. This gives the impression through the perforated tinfoil, which protects the surface that is required to be in relief. In this manner large quantities of articles are prepared that otherwise would have to be painted out individually if the stencil was not used.

The black color universally used as a filler is black sealing wax. The plates are heated and the wax applied as evenly as possible. The excess is removed by rubbing down with emery cloth and then finished with finer grades, using a little oil in connection with the emery or the articles are bright finished by polishing and buffing in the regular manner.—C. H. P.

FINISHING

Q.—Can you give us a formula for producing a gun metal finish on the yellow brass trimmings and lamps of an automobile to be applied directly to the brass work?

A.—It is impossible to produce a gun metal finish upon brass goods, without plating, that will prove substantial. You might try the following: Dissolve powdered white arsenic in strong muriatic acid in an earthenware jar or an enameled dish. Use heat for the solution. Then add a few small pieces of sulphate of copper, one-quarter to one-half ounce to a pint of the arsenic. Cleanse the brass goods with soda solution and remove the oxide with a sponge and water. Next apply a little of the arsenic mixture by the aid of a sponge. Rub well and wash off the excess with clean water. The articles should then be dried and lacquered.—C. H. P.

GALVANIZING

Q.—Will you be kind enough to let us know what pressure the following would produce? Five pounds zinc, 15 gallons water, 15 pounds muriatic acid 26 degrees, 3½ pounds chloride of tin, and 250 pounds small nails, filled in a barrel having a capacity of 4.1 cu. ft., making 30 revolutions per minute. With all these contents the barrel is only half filled, but is air tight.

A.—Your problem can only be solved satisfactorily when the reaction between the zinc and muriatic acid is complete. Theoretically the pressure in the barrel would be 200 pounds. This pressure would also be influenced by the temperature of the solution. In practice, however, this pressure would not be attained since the reaction could not proceed to completion on account of the high pressure. The only way to find the actual pressure under your conditions specified would be to fit the barrel with a pressure gauge or an automatic blow off that can be regulated according to the pressure produced.—C. H. P.

GILDING

Q.—How can we gild and silver aluminum?

A.—After coppering, any of the usual formulas can be used for silvering or gilding aluminum. It is necessary to scratch brush the surface after copper plating to produce a bright surface on the articles after silvering or gilding.—C. H. P.

INSULATING

Q.—I would like to know of a good material to coat inside of steel plating tanks for brass and bronze solutions, a material that will stand a warm solution, about 110 degs., or a little more. I have three 275-gallon tanks. The copper works splendid, but brass and bronze act very badly at times, and I blame it to the part of tanks not being coated on inside to insulate them.

A.—There is no reason why your brass and bronze solutions should not give equally as good results as your copper bath. It is impossible to insulate your steel tanks with any of the regular insulating material used for cold baths. You might use a wooden lining made up of ½-inch spruce or pine. If your baths are plentifully supplied with copper and the color maintained by adding a small amount of carbonate of zinc dissolved in ammonia, and a very small amount of arsenic dissolved in caustic soda and hot water, to keep deposit clear and the requisite amount of free cyanides to keep the anodes clean; no trouble should then be experienced as far as the steel tanks are concerned. When brass or bronze solutions are not used continually it is advisable to keep up their proper action by hanging two or three strips of sheet steel two or three inches wide on the cathode or work pole, using a low current during this time.—C. H. P.

MIXING

Q.—Will you kindly inform us through Shop Problems what is the best formula for a white metal packing for ammonia pumps?

A.—We advise you to try the following:

Lead	77
Antimony	17
Tin	6

This formula is said to be used by several of the leading valve manufacturers and to be satisfactory.—J. L. J.

Q.—I should be pleased if you could give me a mixing suitable for rollers for grinding cereals, alkalis must not have any action upon it, and incapable of forming verdigris. Also a mixing for nickel bronze suitable for high superheat, and how to mix and treat in foundry.

A.—Chilled iron rolls would be suitable for rollers for grinding cereals, and the iron would not be attacked by alkalis. To prevent rusting the rolls should be nickel plated. It is usually customary also to heat the rolls to such a temperature that the nickel welds on to the iron. Monel metal is suitable for high superheat castings. It is cast in dry sand molds and treated in a general way like steel, although not having quite as high a melting point as steel.—J. L. J.

OXIDIZING

Q.—Will you please give me a formula for a black oxidize for silver-plated casket handles. Our sulphurett dips are blue-black and do not have enough lustre. Are the best results obtained by burnishing the silver before dipping, and what kind of a wheel should be used to finish the oxidize?

A.—If you desire to produce a silver oxide with a higher luster it will be necessary to scratch brush the articles, after oxidizing. This is accomplished by brushing with a brass wire machine scratch brush. For your purpose a brush four to five inches in diameter and four rows of wire, not less than 30 B & S gauge would be about right. The wire should be of the crimped variety which produces a soft brush. After oxidizing the articles are washed and dried out and then brushed dry. If this does not give sufficient luster, the articles will have to be brushed before oxidizing. This operation is accomplished in the same manner, only the articles are kept wet while brushing; for this purpose a little sal soda is added to water about two ounces to the gallon, or it can be arranged that the soda water drops upon the brush while in motion.—C. H. P.

RESISTING

Q. You would greatly oblige me by letting me know if there are any gum varnishes or cements or formulas of such that will resist the softening attack of the gold solution, something that will retain its adhesiveness for at least three hours' run.

A.—Air drying asphaltum varnish is commonly used for the purpose of painting out. When this becomes dry and hard it gives as good a result as any method. Gum copal dissolved in benzole and colored with aniline blue is another method used by a number of silverware manufacturers. It appears to us that a good rubber cement should prove satisfactory for your purpose for such a length of immersion. Any of the substances mentioned can readily be removed with gasoline after the deposit is obtained—C. H. P.

TINNING

Q.—Will you kindly give me information as to the following through the Shop Problem Column (1) How to obtain a clear smooth surface on malleable iron before tinning? (2) How to show a bright and white appearance after tinning? (3) What is the best flux to use on tin pot?

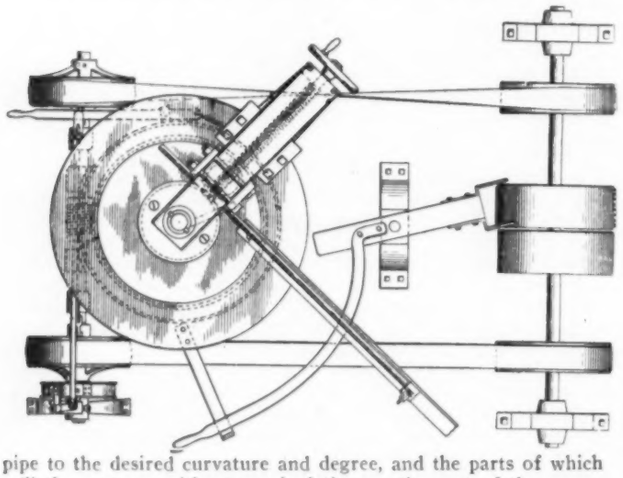
A.—Malleable iron is best given a clear smooth surface preparatory to tinning by a thorough tumbling in gravel and water. (2) To obtain a bright and white luster use a roughing kettle and finishing kettle of tin. Run the finishing kettle at about 450 degs. Fahr. and cool the work in kerosene oil. (3) Beef tallow 90 per cent. and palm oil 10 per cent. is a good flux for the tin pot.—J. L. J.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

957,199, 957,200. May, 10, 1910. Tube-Bending Machinery. John F. Gail, Kenosha, Wis. Assignor to The Simmons Manufacturing Company, Kenosha, Wis.

These patents cover machinery designed to bend tubes such as are used for bedstead work. The machine shown in cut embodies some of the new and novel features claimed for the invention. The main object is to provide a machine which, when properly adjusted, will automatically bend an inserted tube or



pipe to the desired curvature and degree, and the parts of which will then return, without manipulation on the part of the operator, to their original or initial positions ready to receive and bend another piece or section of tube.

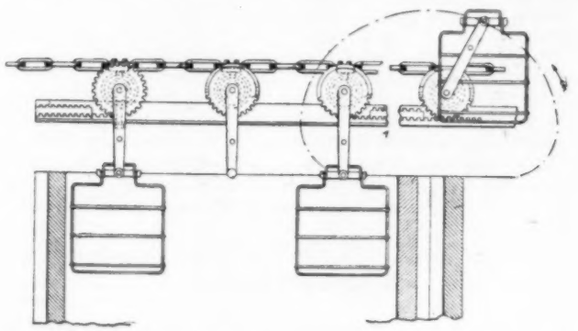
Another feature of the machinery is to produce in a pipe or tube a plurality of bends at the same time, whereby the pipe or tube forming the main portion of the head or foot of a metallic bedstead may be readily bent to shape. The novel mechanism for producing the bending is largely automatic in its operation.

963,123. July 5, 1910. Electrical-Resistance Alloy. J. T. H. Dempster, Schnectady, N. Y. Assignor to General Electric Company, N. Y. An electrical resistance material that can be used in rheostat work is composed of the following: iron 70 to 75 per cent., nickel 20 per cent., chromium 6 to 3 per cent., manganese 4 to 2 per cent. In this composition, the main body of the alloy is iron and nickel, since they constitute from 90 to 95 per cent. of the whole content, while the chromium and manganese constitute from 5 to 10 per cent. of the content. Wire made from this alloy is found to have approximately twice the resistance of German silver. The metal may be drawn and rolled as easily as soft iron, and a uniform product may be produced at a very low cost.

963,817. July 12, 1910. Dipping Mechanism For Electroplating Apparatus. J. H. Shaw, New Haven, Conn., assignor to Sargent & Company, New Haven, Conn.

This invention has for its object the production of a simple and efficient apparatus for continuously carrying on the operation of electro-plating by providing mechanism for automatically immersing and extracting the articles to be electro-plated and transferring them from one bath to the other. This object is accomplished by means of a traveler supporting the carrier from the work holder, and mechanism for actuating the carrier at the proper time to raise the work holder to remove the articles from one bath and immerse or dip them again in the next succeeding bath. Hitherto the means provided for raising and lowering the work holder have failed to give the articles the full benefit of the bath, because the articles have been gradually raised from and lowered into the bath as they have traveled from one end of the tub to the other.

The present invention provides a rotary member that actuates the carrier to swing the work holder in a reverse direction from the movement of the traveler as the work holder is raised or



lowered, thereby permitting the articles or work holder to travel on the same horizontal plane the full length of the bath.

964,096. July 12, 1910. Process of Electroplating. Thomas A. Edison, Llewellyn Park, Orange, N. J.

It has been found in the process of electroplating that the occlusion of hydrogen tends to make the deposit somewhat brittle and more or less porous, and that hydrogen gas clings to the surfaces of the deposited metal in the form of very fine bubbles, thereby making the surfaces more or less warty and rough. The presence of occluded hydrogen, as well as of the hydrogen bubbles referred to, prevents the deposition at a high rate, and also results in streaky and uneven deposits.

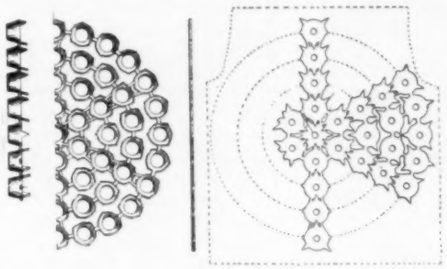
By the elimination of the hydrogen it is possible to carry on a plating operation at a much higher rate than is now possible, and at the same time with the production of a better quality of deposit, less brittle in character, practically free of pores, and with a smooth and uniform surface. This invention is based on the fact that by maintaining in the plating bath a small quantity of material which will combine with the hydrogen, for example, free chlorin, the latter will combine with any hydrogen set free by the electrolytic action, or otherwise, thereby preventing the formation of metallic hydrates as well as the occlusion of the gas, and eliminating also the appearance of microscopic bubbles thereof, which cling to the deposited sufaces with the objections pointed out. When free chlorin is thus present in the bath, it combines with any hydrogen generated therein to form hydrochloric acid, although it is possible that other favorable reactions may be brought about by the presence of free chlorin. The chlorin may be added to the plating bath in any suitable way, such, for example, as by passing the gas continuously, or at suitable intervals, through the bath; by adding to the bath, water saturated with chlorin, or by adding from time to time fresh quantities of the electrolyte saturated with chlorin. For instance, if copper is to be plated from a solution of sulfate of copper, the chlorin can be added by chlorinating a suitable quantity of the solution, which can be added from time to time in small amounts to the solution as the chlorin becomes exhausted. In practice, the solution should have a slighty acid reaction.

964,478. July 19, 1910. Method of Deflocculating Insoluble Bodies. E. G. Acheson, Stamford, Canada. This is a process for deflocculating graphite by means of which the graphite in a fine state of sub-division is moistened with water to form a fine paste. Preferably there is incorporated with the mass a suitable proportion of dextrin or equivalent material, the function of which, in part at least, is to facilitate the subdivision or disintegration of the graphite and to prevent coalescence of the constituent particles.

The dextrin may be added in the proportion of 20 to 30 per cent. or more of the weight of the graphite, being introduced thereinto in solution in the water used for preparation of the paste. The paste is then worked or macerated, preferably in mechanically operated mills, and the deflocculating agent added thereto in a regulated manner.

964,625.—July 19, 1910. Cluster Setting for Jewelry. J. A. Doran, Providence, R. I.

The object of this invention is to produce economically a circular cluster setting, as shown in cut, for jewels, such as stones, gems, or other ornaments, which may be given a variety of shapes, and will retain the jewels firmly in place,



without the use of solder, or other extraneous means, for connecting the several settings constituting the cluster.

The cluster setting of this invention comprises a metal sheet, so cut and cupped or drawn as to produce a series of connected settings, the connections being as well inconspicuous and secure, so that the settings as a whole, in cluster form, may be given a variety of shapes, to produce pin-heads, hat ornaments, and a great variety of articles, both utilitarian and ornamental.

964,566. July 19, 1910. Manufacture of Aluminium and its Alloys. H. F. D. Schwaber, Belleville, Ill.

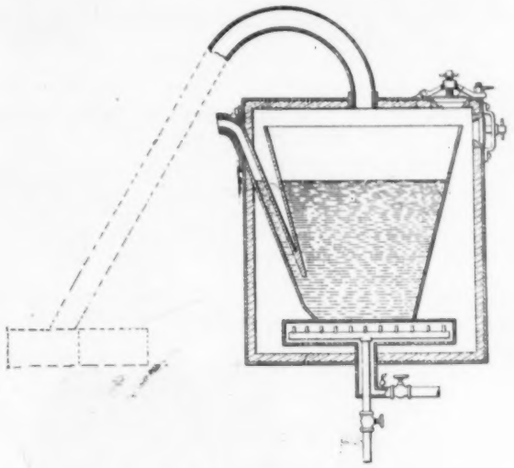
By means of this process sulfate of aluminum is diffused, at high heats, with carbon in quantities proportioned to the oxygen contained therein, thereby producing a combination corresponding approximately with the formula $Al_2(SO_4)_3C_{15}$, and then passing through such combination an electric current, suitable in the presence of a solid or gaseous flux or both, while excluding the outer air by a suitable reducing gas and which obviously can be also accomplished by the resultant spent gases.

As a source of carbon, to combine with the sulfate of aluminum, there may be used pitch, asphaltum, tar, petroleum or the like, wood charcoal, carbonaceous matter or any other substances including gases capable of giving up carbon at their decomposition into their constituent elements if heated with the anhydrous sulfate of aluminum at a temperature of about 900 degs. Cent. or at incandescence; when such nascent carbon will readily combine with the sulfate by its great affinity for the same, especially when a substance such as pitch has been used for a source of the carbon, and convert it into an electric resistance conductor or electrolyte, thereby permitting an electrical reduction of the sulfate, which otherwise would not be possible.

964,896.—July 19, 1910. Reducing Metal to a Molten State for Casting. W. S. Bryan, Memphis, Tenn.

This invention covers the furnace shown in cut, and is designed to furnish molten metal direct from the crucible to the mold. The furnace is provided with a lining of non-conducting material, and having in its top an opening which is normally tightly closed when the apparatus is in operation, by means of a gate. This gateway affords an entrance for metal to be melted in a crucible located within the furnace and supplied with heat by means of burners. Liquid or gaseous fuel may be employed and conducted to the burners from any suitable source of supply through a pipe passing through the bottom of the furnace and suitably packed to prevent the escape of air from the furnace chamber. A valved air pipe may be employed for supplying sufficient oxygen to support combustion at the burners. Instead of using liquid or gaseous fuel, the crucible may be heated by suitable electrical heating means.

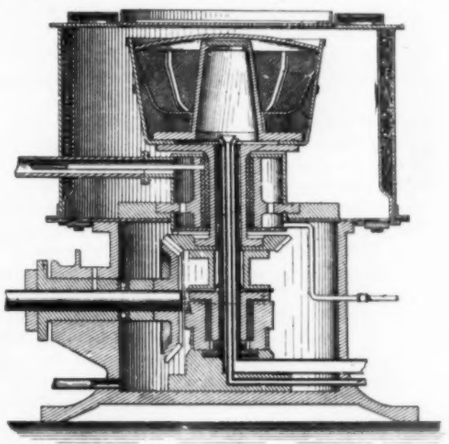
The crucible is provided with an outlet spout which communicates with the crucible at the bottom of the latter and extends upwardly in an inclined or diagonal direction and passes through the wall of the furnace, terminating at its



upper end (exteriorly of the furnace wall) in a nozzle, which is intended to communicate with a mold to discharge molten metal thereinto for casting the same.

965,580. July 26, 1910. Apparatus for Extracting Tin from Tin Scrap. E. C. Higgins, Bayonne, N. J., assignor of one-half to A. D. Briton, Brooklyn, N. Y.

By means of the apparatus shown in cut, tin is removed from tinned steel scrap. The machine operates as follows: The covers of the machine being removed, the bundle of tin scraps is thrown into a basket, resting on the false bottom formed by ribs. The air and the fuel supply, preferably gas under pressure, is then admitted to the combustion chamber through pipes, and the water for cooling the bearings is turned on. The fuel is then ignited and the covers replaced. The products of combustion escape from the combustion



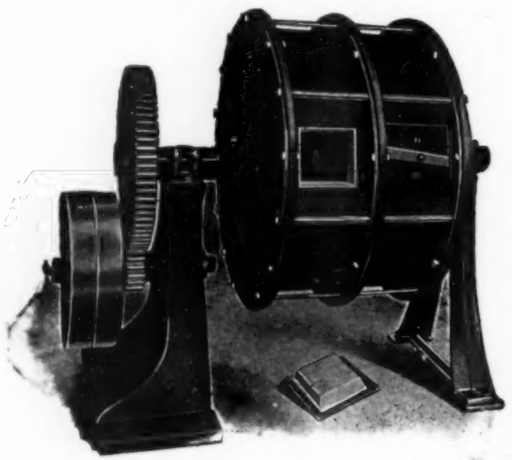
chamber as by leakage. Power is then applied to the shaft, causing the basket to be rapidly rotated through the means disclosed. The speed of rotation is preferably 650 revolutions per minute. The walls of the combustion chamber become heated sufficiently to radiate heat in the basket at a temperature sufficient to melt the tin, although the flame does not contact with the tin, and hence cannot oxidize the same. The space between the false bottom formed by the ribs and the bottom of basket permits the radiated heat to easily pass up through the tin from beneath as well as through the upwardly extending walls of the combustion chamber. The melted tin is thrown off the scraps and out of the basket through a wire mesh screen and against the wall by centrifugal force. The tin is permitted to cool, and may from time to time be removed through openings provided for the purpose.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

THE GLOBE-ABBOT TUMBLING BARREL FOR BURNISHING WITH STEEL BALLS

The July issue of THE METAL INDUSTRY contained an article giving direction for using steel balls, manufactured by the Abbott Ball Company of Hartford, Conn., in the polishing and burnishing of small articles. It is said that while the burnishing with steel balls is a simple operation when understood, its successful application calls for a peculiar type of tumbling barrel. The barrel shown in cut is the outcome of long experiment by the Globe Machine and Stamping Company, Cleveland, O., and is



THE GLOBE-ABBOTT TUMBLING BARREL.

claimed by them to be the only barrel obtainable that is exactly suited to the process of burnishing with steel balls. They say:

"A burnishing barrel must be of the horizontal type and must be of wood or wood-lined. The interior surface must be irregular—in the barrel shown the inside of the barrel is octagon. Globe-Abbott Tumbling Barrels may be had either single or double. The barrel shown weighs empty 1,800 pounds and occupies a floor space 42 by 62 ins. The proper pulley speed is 60 r. p. m. and the barrel speed is then 15 r. p. m."

Regarding the actual process of burnishing with these barrels the company remarks:

"As it is the balls that do the burnishing, there should always be enough balls so that the articles treated will not rub one another. A safe rule is to use two pails of balls for each pail of material. And for each pail of material a pail of hot water is needed. Before adding the water about six ounces of soap chips or Hascoline Burnishing Chips, manufactured by Haas Bros. Company, Newark, N. J., should be dissolved in the water. The ordinary practice is to use six ounces of Hascoline chips to two gallons of water, but local conditions govern the amount. It will be safe it is stated to use this amount until the operator becomes familiar with the process. If soap is used it should be Ivory or some other mild and pure soap. Ordinary soap contains alkalies and other impurities which are likely to attack both the balls and the material being burnished.

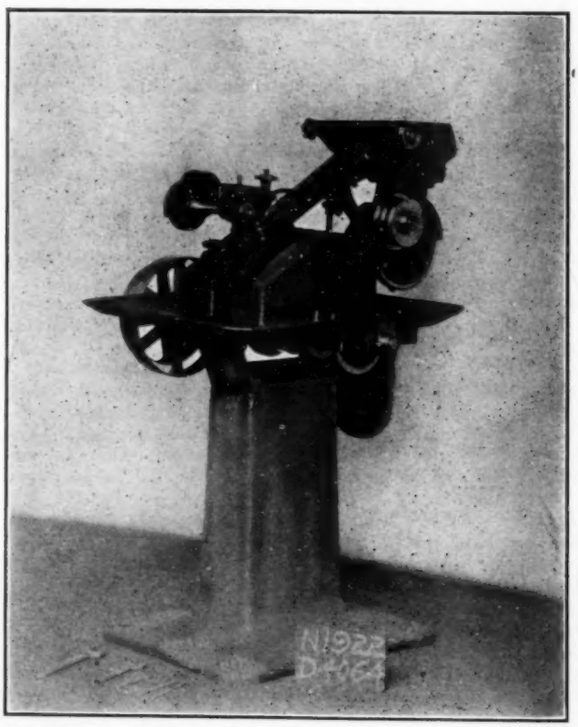
Information can be had regarding the products by writing to The Globe Machine and Stamping Company, Cleveland, O., and enquiring for their "Globe" catalogue.

In their pamphlet "ABC" the Abbott Ball Company of Hartford, Conn., give further particulars about their steel balls, and Haas Brothers Company, 11 Clinton street, Newark, N. J., furnish full instructions for the use of Hascoline Burnishing Chips.

NO. 1 AUTOMATIC SCREW SLOTTER.

The Automatic Screw Slotting Machine here illustrated and described according to the manufacturers, embodies many new and valuable features which have been carefully studied and thoroughly tested out. It is constructed so that the maximum length of time possible is given to the sawing, and the minimum length of time for handling the work to and from the sawing position. The machine as described has features which provide for accuracy and high quality in the product as well as economy. Features which are noteworthy follow: The screw blank is rigidly held while the slotting is taking place. The frame which carries the saw and its arbor are rigidly held and of ample proportions so as to avoid chattering, but not made in any way clumsy, thereby not interfering with quick action. This bracket is provided with sensitive adjustments which accurately locate the position of the saw with respect to the screw head, giving both side to side and front to back adjustments. There are adjustments as well for the saw for determining the depth of the slot which can be operated when the machine is running, and also for allowing the maximum amount of time for slotting even though the slots are of varying depths.

The saw is well guarded to not only keep danger away from the operator, but also to keep the oil and chips from flying. The guard is so constructed that it is quickly swung out of the way when saws are to be changed. The saw is held on its spindle between two clamps by a nut. No key or dowel pin is used.



WATERBURY FARREL FOUNDRY AND MACHINE COMPANY'S SCREW SLOTTER.

The diameter of saws for which the machine is designed is 2¾ ins., with a hole not smaller than ¾ in. in diameter. Slightly larger saws can be used as well as the standard saws, which grow smaller as they are ground down. When the saws are changed, the saw spindle is held from revolving when the clamping nut is being loosened or tightened by a pin which is temporarily inserted into the driving gear or pulley. The saw spindle

runs in bronze bushings, the one next the saw being tapered and split for taking up any wear. The machine is arranged so that the chips and finished blanks are delivered into separate receptacles. The chip receptacle is the small removable box shown in the illustration. The screws are delivered into a pan placed at the right of the box. This pan is not furnished with the machine. Provision is made for delivering a lubricant on the blanks and saw while the slotting is taking place. The lubricant is pumped from a small tank located below the bed by a small geared pump and delivered through suitable valves and piping to the operating point; from there it flows with the chips into the chip box where the chips sink to the bottom and the lubricant flows over the sides, draining back on the table into the tank. The tank is readily removable for cleaning, but it is especially to be noted that the chip box receives the bulk of the chips and consequently the tank does not require frequent emptying provided suitable attention is given to the box.

Provision is made to allow the machine to operate at the speed which is most suitable for the particular screw to be slotted, the power for driving the saw being obtained through a belt from the countershaft to a pulley 4 ins. in diameter by 1½-ins. face, which is geared 3 to 1 to the saw spindle for steel work, while for brass work a pulley of the same size is located on the saw spindle itself. The hopper feeding mechanism is provided with simple adjustments to adapt the machine not only for work which is done in long runs, but as well for short runs. To shift from one size blank to another it is necessary to replace two pieces only. The machine handles blanks with shanks equally as well as those with long shanks up to the capacity, which is 1½ ins. long under the head. The largest diameter of shank allowed is ¼ in. Blanks having a length of shank equal to one diameter have been successfully fed by the hopper and slotted in the machine.

In the operation of the machine the blanks are placed in the hopper, where they are caught by their heads in a blade which has a slot along its top a little wider than the body of the blank. The blade swings vertically through the center of the hopper, and when in its lower position is parallel with the bottom. As it is elevated through the mass of blanks some get caught by their heads and carried to the upper position, which is an extension of the inclined chute. Here the blanks slide into the chute. Near the point where they leave the blade is a rapidly revolving toothed wheel located and adjusted so that any blanks which attempt to enter the chute excepting in the proper position are thrown back into the hopper. This leaves the entrance to the chute clear and prevents clogging. The chute cover is hinged so that it can be swung up for removing any blanks that may become lodged. At the foot of the chute the blanks enter the carrying dial, which is 27/16 in. in diameter and ½ in. thick. If a blank becomes held half in the dial and half in the chute, a slight special motion which is given to the dial agitates the column of blanks and starts the feed after the loss of only one revolution of the machine, and entirely without the attention of the operator. The carrying dial has "V" notches in its periphery which carry the blanks from the chute to the slotting point. After being slotted the blanks are carried a little further and delivered into their receptacle.

The hopper blade is made with a removable top which contains the pick-up slot. These tops are changed for different sizes of screws. We can furnish these to order slotted, and with holes drilled for fastening them to the hopper slides. Carrying dials can be furnished ready to put on to the machines. The chute is adjustable for different diameters within the limits of the machine. The chute is adjustable for different diameters within the limits of the machine. Standard Stock Machines are furnished with a countershaft; a pulley for the saw spindle for brass work, a set of wrenches, a saw and dial, all suitable for operating on work like a sample which customer furnishes with his order. All machines are tested before shipment on blanks which the customer should always furnish. The main drive for the machine is through a two-step cone pulley. If the countershaft runs 270 r. p. m., the saw can run at either 1215 or 405 r. p. m., and the machine at either 90 or 60 r. p. m. By varying the speed of the countershaft these speeds are changed proportionately, the countershaft has 10-in. x 2½-in. tight and loose pulleys.

Floor space	30 x 34 ins.
Weight of machine	600 lbs.
Weight of countershaft	225 "

This design of machine can be readily adapted to larger or smaller sizes. These machines are manufactured by the Waterbury Farrel Foundry and Machine Company, Waterbury, Conn., who will gladly furnish information upon request.

"CUPROR" A NEW METAL.

By F. W. Barker.

The new metal, Cupror, just now being introduced on the market by the Cupror Co., of 50 Church street, New York, is the discovery of L. C. Smith, who devoted a great many years of his life in laboratory investigation and research after conceiving the idea that he possessed the means of producing a gold-like metal. The measure of his success is evidenced by the proven qualifications and properties of Cupror.

L. C. SMITH.

This metal, though composed almost entirely of copper, fails to respond to the tests for copper. It will not oxydize nor corrode, and is unaffected by the attacks of hydrochloric acid and sulphuric acid. Nitric acid affects Cupror as it does low grade gold. Cupror is of a rich gold color, and has a beautiful permanent luster. Tarnish, dirt, coating with salt, etc., removes from Cupror by washing with soap and water, leaving its brilliancy unimpaired. Thus, for all purposes of an ornamental metal, where exposed to the weather and sea air, Cupror holds a unique position which should bring it into general favor.

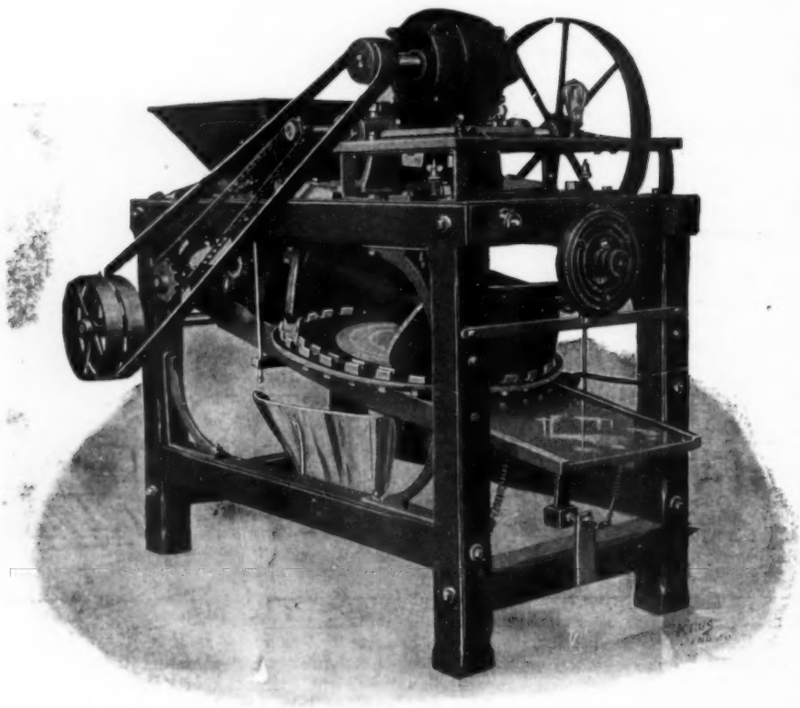
Another peculiar feature of this metal is that it can be produced with a degree of hardness approximating that of steel, while it can also have sufficient softness and ductility to permit its easy working and shaping into any desired form. Coupled with its other advantages is the quality of great tensile strength, the hard-drawn Cupror wire breaking at 138,550 pounds to the square inch, this attribute bringing the metal into certain fields where a noncorrosive metal capable of withstanding heavy loads has long been desired.

Judging from the results of tests made at Stevens Institute and elsewhere, the spheres of usefulness for Cupror seem almost limitless. It is ideal for cheap jewelry, resembling gold in all but weight (its specific gravity is 8.11, as against gold at 19.36). For automobile fittings, shop fittings, building hardware, etc., it saves lacquering and reduces the labor and cost of keeping clean and bright to a minimum. Cupror is manufactured by the Cupror Company, 50 Church street, New York, who is offering its product in ingot form, in bars for rolling, and in sheet, wire, rod and tubing of all gauges and sizes. Adelburt G. Herbert is the New York representative of the Cupror Company.

An analysis of "Cupror" shows it to contain copper 94.2 and aluminum 5.8 per cent. This puts it in the class of a 5 per cent. aluminum bronze, about which a great deal has been said and done. Owing to the difficulties attending the casting and mechanical working of aluminium bronzes in general, they did not prove all that was promised or expected of them. We understand, however, that the inventor of Cupror claims that he has discovered a method of mixing and melting the two metals, copper and aluminum, whereby he has finally overcome the inherent difficulties encountered in the ordinary methods of alloying. By virtue of the method of preparing the alloy it is claimed that no trace of the chemical agents used can be found in the resulting alloy. It is reported that the manufacturing jewelry trade has taken considerable interest in Cupror, and we hope to have more information in the near future.—Ed.

DINGS MAGNETIC SEPARATOR WITH DIRECT CONNECTED DYNAMO.

This magnetic separator shown in cut and known as the disk type, is especially recommended by the manufacturers for use in brass foundries and metal refining works. They say that the continued increasing demand for these machines justifies their claim that it is the best magnetic separator on the market for removing iron from brass and copper turnings, borings, punchings, washings, skimmings, fine scrap, etc., and with their new form of magnets is now better than ever. The magnets consist of a large stationary primary magnet body and a series of small secondary induced magnets mounted upon a rotating disk. The primary magnet is held solidly in a fixed position and has heavy double coils and cores with pole pieces projecting downward and conforming to the circle of the disk. The secondary magnets, which are made of the best Swedish iron, are inductively energized by the primary magnets when over the conveyor, but become demagnetized as they leave the proximity of the primary poles and automatically discharge any iron or magnetic material they may have attracted, allowing it to drop at the points on the sides where the disk overhangs the conveyor, and is conveyed by chutes into a box or receptacle on the floor beneath. The non-magnetic metal passes off at the end of the conveyor to final delivery.



THE DINGS DIRECT CONNECTED MAGNETIC SEPARATOR.

In places where direct current electricity is not available, or where a special dynamo is desired for operating the separator, a small dynamo direct connected to the separator and made a part of the machine is furnished, as shown in the cut. These dynamos are high grade machines of standard make.

The separators are made for either belt drive or for direct connected motor drive. It is sometimes desired that the separator be located in a stock room or a foundry where there is no convenient line shaft to connect with, and in such case a motor drive is very convenient, as the separator can be set in any location or moved from one place to another wherever it can be reached with wires from an electric system. In using the separator for brass stock it is found more satisfactory to have a machine large enough to clean up a week's supply of borings in a few hours than to keep a small machine running constantly. It often happens that a plant has a dynamo run for lighting purposes only, which is shut down during the day. In this case a capacious machine is found profitable, as the borings can be separated evenings or mornings while the lights are being operated, avoiding the necessity of running a small dynamo, especially for operating the separator.

SPECIFICATION.

These separators are made in five styles, of which the following are the specifications.

No. 2.—Capacity 500 to 1500 lbs. of metal per hour. Shipping weight of plain belt driven separator, 1400 lbs. Floor space required, 3 x 6 ft. Speed, 440 r. p. m. Driving pulley, 12-in. diameter, 2-in. face. Electricity required for the magnets, 300 watts. Mechanical power required, ½ h. p.

No. 1.—Capacity 200 to 500 lbs. of metal per hour. Shipping weight, 650 lbs. Floor space required, 2 x 4 ft. Speed, 440 r. p. m. Driving pulley, 6-in. diameter, 2-in. face. Electricity required for the magnets, 200 watts. Mechanical power required, ¼ h. p.

Further information can be obtained by writing to the manufacturers, the Dingo Magnetic Separator Company, Milwaukee, Wis., and enquiring for bulletin 14 M.

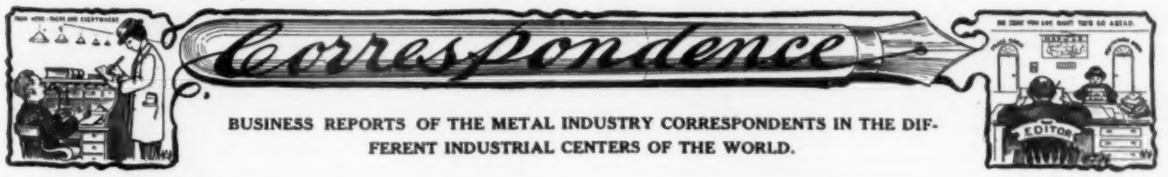
FLAKE GRAPHITE AS A LUBRICATING FACTOR.

The Joseph Dixon Crucible Company, Jersey City, N. J., report in reference to a problem in lubricating, which was solved by the application of flake graphite. A certain manufacturer had an order for a machine that included three hollow gun metal rollers, one weighing 1386 pounds, the other two weighing 752 pounds apiece. These rollers are heated by gas to a temperature of about 700 degs., and it was found that any oil or grease would carbonize and cut the journals in a very short while.

The Dixon company recommended as a way out of the difficulty the use of graphite on the rollers. This was done and the results were entirely satisfactory. The following gives a description of how the graphite was applied to the journals, and we have no doubt will be interesting to anybody that is a user of lubricating materials. "The method of applying the graphite to the journals is very simple, the channels for conveying the lubricant to the journals are cut in the boxes about ⅜ ins. wide and ¼ in. deep, one on top and one at a little above and on each quarter. Besides this, a spiral groove of the same dimensions is cut for about two turns, commencing at about 1 in. from the other end of the box and near the bottom. These grooves are half round in section. Into the top straight groove a ¼-in. pipe hole is drilled and tapped, a piece of ½-in. pipe screwed into this with a reducing socket on the top end to 1¼-in. pipe, a 1¼-in. nipple with a 1¼-in. cap complete the cup. A piece of 3/16-in. round C. R. steel with one end on the journal, with the other end up near the top of the cup, complete the device. The journals take about a dessert spoon full of graphite per day to each journal, the machine attendant occasionally removing the cap from the cup, churning down a little of the graphite with the 3/16-in. rod."

BRADLEY PROCESS FOR RUST PROOFING.

The Bradley process is a hydrogen gas treatment. The article to be rust-proofed is placed in a muffle, where it comes in contact with hydrogen gas and other materials necessary to the process, and then subjected to heat. This forms an alloy on the surface which resists the action of oxygen in air or water. Articles which are thus treated require merely a brush, soap and water to clean them. This process is now being operated by The Bradley Rust-Proofiing Company, 37 Ferries street, Brooklyn, N. Y., under the J. J. Bradley patents. The company are prepared to treat articles of wrought grey and malleable iron castings, drop forgings, etc.



BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

AUGUST 8, 1910.

In strong contrast to the pessimistic tone of New York business men is the sentiment in Naugatuck valley industrial circles. While the summer dullness is here as everywhere, there is by no means an unpromising outlook. It is a conservative optimism that is noted and orders are coming for holiday goods in a way to give it substantial backing.

In the watch business, especially, is this spirit noticeable. The Waterbury Clock Company, whose output of Ingersolls is about 12,000 daily in rush season, is keeping up to that pace on its five days a week schedule, and the New England Watch Company has just started a force of over a score of salesmen on the road with promises of a lively fall business. Holiday watch orders are coming in reassuringly and this fact is taken to indicate confidence in conditions commercially throughout the country. This week the New England Watch Company begins its ten-days' vacation, but it has been hiring in help throughout the past few months, and even in July.

At the Scovill Manufacturing Company's plant five days a week proved too slow for orders, and most departments are back to five and a half days, with normal complement of help in all departments. A few departments are doing night work. A large force of men is busy on an extensive tract of land which is being graded and made useful for either future factory additions or a large shipping plant, It is at the east end of the plant and extends along the Mad river and the tracks of the Meriden Railroad. Factory additions recently reported under construction are being rapidly completed and men familiar with the plant's dimensions three years ago are amazed at its size and wonderful lay-out today.

At the Chase plants and the American Brass Company's plants in this city, as well as in Ansonia and Torrington, summer schedules are in force with a favorable fall outlook in practically every branch.

The recent reports of the heavy copper business of the American Smelting & Refining Company is not any cause of wonder here and is particularly pleasing news to the American Brass Company. This new power in copper is affiliated through C. F. Brooker with the American Brass, and its success augurs well for the copper purchasers in the Naugatuck valley.

In the novelty manufacturing lines and the silver factories conditions are normal for this season and the prospects reported as fair.

Collections are a trifle slow.

In the coming month there will be a gradual resumption of activity all around and full time is likely to prevail generally by Sept. 6.—F. B. F.

PROVIDENCE, R. I.

AUGUST 8, 1910.

During the first two weeks in this month a number of the manufacturing jewelry establishments, not only of this city, but of the neighboring towns of Attleboro and North Attleboro in Massachusetts, were closed down for the annual vacation period. This was the most general shutdown that the industry has ever had and was the result of conferences conducted by the New England Manufacturing Jewelers' and Silversmiths' Association so as to have as many of the factories as possible closed at the same time. Beginning at noon today, about 30 more concerns close their places for one or two weeks, according to the individual conditions.

The shops that have already taken their vacation and cleaning-up period have resumed work and the report from the majority of firms is that there are many orders on the books and that the prospects for the fall and holiday trade are the most encourgaging that have been experienced in several years. An evidence of this is to be seen in the unusually large number of advertisements in the daily newspapers for help of all kinds wanted.

The mesh bag industry continues to grow until it has developed already into a sort of "home and fireside" affair. The manufacture of these articles has been let out by the large manufacturing concerns for some time, as they were unable to meet the demands. The persons to whom this work is let out, have adopted the method of sub-letting the work, until Rhode Island homes have generally become little manufacturing plants. High school children are picking up quite a sum of money during the summer vacation at the work of making mesh bag sides, and there are scores of them working at it. In one of the recent issues of a daily newspaper four of these sub-letters advertised for 1,600 makers.

The extensive plant of the Gorham Manufacturing Company in Elmwood district of this city is closed down for the usual two weeks' vacation. The only department that has been kept in operation is the bronze foundry, and here the numerous orders made it impracticable to close down. This department has become one of the most extensive and important in the entire establishment and additional orders are being continually booked. At present there is more than a year's work in sight. The silverware department, especially that devoted to the making of services for the various battleships, are also busy. At the present time the company has sets for at least four of Uncle Sam's big vessels on its hands. Another department that is making great strides is the stained glass window section, and it is said to be more than possible that the company will erect a building for this branch in the near future.

A new metal, said to possess remarkable qualities, is being tested by several manufacturing jewelry concerns in this city and the Attleboros as to its adaptability for their purposes. It is called "Cupror" and is made by a New York firm either in ingot form, or in sheet, wire or tubing. Though a copper alloy, it is so treated that it is said to be absolutely proof against oxidization or corrosion and the effects of salt air and water.

The co-partnership which has heretofore existed between Frederick G. Reynolds and Jennie E. Tilley under the firm name of the Turner Jewelry Company has been dissolved.—W. H. M.

PHILADELPHIA, PA.

AUGUST 8, 1910.

L. P. White and several of the larger jobbers in watches and jewelry have already started their salesmen on the road with samples for the Christmas trade. These important factors in the trade are firm in the conviction that this will be the greatest year the retail jewelry trade has ever known and they are making every possible preparation to meet the expected demand for gold and silverware. This confidence is not fully shared by leaders in other lines, but it has certainly stimulated all branches of the metal trade in this region. More than 800 buyers from points all over Pennsylvania were in this city two days last week and their buying in all lines shows a marked degree of optimism.

A bronze figure representing "Victory" has been shipped to Gettysburg by the Bureau Brothers' Bronze Works. The effigy will be placed on the dome of the State Memorial Building. The statue is 23 ft. 6 ins. in height and was modeled by Samuel Murray, of this city.—C. H. C.

BRIDGEPORT, CONN.

AUGUST 8, 1910.

Business in this city continues very good. Practically all the factories are running full time, and report plenty of orders on hand and a bright outlook for the fall trade. Labor conditions continue quiet. There is considerable activity in the building line.

The Bridgeport Carbureter Company has been recently organized in Stratford, for the purpose of manufacturing carbureters. The officers are as follows: John Miller, president; George Youngs, secretary and treasurer, and Adam Blackert, general manager. They have taken possession of a factory building on Johnson avenue, and expect to give employment to quite a number of hands.—W. H. D.

DETROIT, MICH.

AUGUST 8, 1910.

The month of July just closed has been unusually lively in plants of brass concerns that engage in the manufacture of automobile parts. Scores of these factories all over the city and out in the suburbs are running to their greatest capacity and are taking on all the new men who apply. There seems to be no let up in the automobile business at this period of the year and manufacturers forecast a remarkable growth in the industry during the coming fall and winter. Many plants have their 1911 output already contracted for.

The persistent rumor based as it is said on semi-official statements of a proposed "melon" to be cut by the recently formed General Motors Company is followed by further rumors of the acquisition by it of most of the automobile and automobile accessories' plants of the United States. The list of companies already acquired are as follows: Anderson Carriage Company, Detroit, Mich.; Buick Motor Company, Flint, Mich.; Cadillac Motor Company, Detroit, Mich.; Detroit Motor Parts Company, Detroit, Mich.; Elmore Manufacturing Company, Clyde, O.; Elwell Parker Electric Company, Cleveland, O.; Northway Motor Company, Detroit, Mich.; Oakland Motor Company, Pontiac, Mich.; Olds Motor Works, Lansing, Mich.; Rainier Automobile Company, Saginaw, Mich.; Rapid Motor Vehicle Company, Pontiac, Mich.; Reliance Motor Company, Indianapolis, Ind.; Welch Motor Car Company, Pontiac, Mich.

The Abbott Iron & Wire Works is the name of a new organization which will be devoted to the manufacture of metal work of all kinds, including wire. The capital stock is $2,500. The organizers are Joseph R. Scherer, Adolph G. Buethe, Fred T. Loewer and Wesley D. McClintock. The Michigan Auto Parts Company has increased its capital stock from $50,000 to $300,000. The Monarch Foundry Company will soon erect an addition to its plant at No. 905 Greenwood avenue to cost $2,300.

The American National Retail Jewelers' Association was in session here during the last week in July and manufacturers were attracted from all parts of the country. Over two million dollars in jewelry was displayed at the Hotel Cadillac where the convention meetings were held.—F. J. H.

CLEVELAND, OHIO

AUGUST 8, 1910.

Business conditions with the brass and similar manufacturers in this territory continues to be quite satisfactory, according to reports from most of the factories. The demand for general small castings in brass and copper is quite active, while the aluminum castings' business has never been better. Scores of people are puttering with the airship idea and many special pieces are being turned out in the local shops. The plumbing supply business is booming and heavy shipments are being made from the various factories located here, which are engaged in that line.

The automobile business still continues to surprise by the way it is keeping up. The ten or twelve factories located here are working to capacity and many of them are making additions, so rapidly are they expanding. The country seems to have gone auto crazy, for machines are being bought by the hundreds. Not only are the city folks buying them in heavy lots, but the craze has spread to the villages and the open country. The factories here say they find it difficult to keep up with their orders and the foundry and plating departments are as busy as bees.

Another brass manufacturing concern was added to the list of those already doing business in Cleveland, during the past month when the Peerless Brass Manufacturing Company was incorporated at Columbus with a capital stock of $20,000. John F. Jedticka is the chief incorporator.

Burglars broke into the storeroom of the Aluminum Reduction Company, East 47th street and St. Clair avenue, one night during the past month and carted off forty ingots of aluminum, all the stock of that particular metal which was in sight at the time. What they intend doing with it is a mystery. The police have been trying to locate it for the past week, but have thus far failed. Entrance was gained by prying off a lock on the storeroom door.

Word was received by the county building commission, in charge of the erection of the new $4,000,000 courthouse here that a strike which had been in progress for several weeks at the plant of the Art Metal Construction Company at Jamestown, N. Y., had been settled and that work on a contract for $120,000 worth of metal furniture for the courthouse would be proceeded with at once. It was feared that a continuance of the strike would hold up the metal work so that the new courthouse would be delayed in completion. The same commission is preparing to purchase lighting fixtures for the new courthouse. It will be the biggest lighting fixture contract ever let in Ohio. Plain, but substantial fixtures in solid brass and bronze will be purchased. It is probable that designs will be prepared by Charles F. Schweinfurth, architect in charge of the interior decoration of the new building.

The Tyler Co., manufacturers of ornamental bronze and brass wire goods, is preparing to expand its plant. A large tract of land at the southern end of the present series of buildings, fronting on Superior avenue, has been purchased and work will begin shortly on another new factory. The company claims to be the largest makers of brass and bronze wire screen in the world.—McM.

BIRMINGHAM, ENGLAND

An unsatisfactory report is forthcoming as to the operations of various brass and copper tube companies, covering this branch of the metal trades. The year has not been a good one for those firms making copper, brass and similar cold-drawn tubes. It is barely three years since the ruling association was established, and it is notorious that during the year its influence has been further weakened by important withdrawals of firms, through the inability to maintain trade and meet competition at association prices. The competition has been most severely felt in various alloyed metals, not subjected by the purchasers to strict analysis. British and Continental firms are on more equal terms in pure metals such as copper, where the foreign competitor is practically in the same position in requiring his raw material. Unfortunately, the outlook is not cheerful, with the slight prospect of anything like effective combination, and the only hope for the trade is that the demand during the coming year may be sufficiently large to make output profitable, purely on account of its bulk. Practically all the big firms have failed to make a profit and some have heavy balances on the wrong side.

In other directions the trade has been making history. For more than a year controversy has been constant between manufacturers and the home office and the factory inspectors, with regard to various regulations for brass-casting and metal-using factories. The government has been unusually active in this department, and with a view of preventing lead poisoning and certain injurious effects to the workpeople from fumes as well as from the dusty exhalations in polishing and grinding various regulations were imposed, the stringency of which provoked opposition from the manufacturers. In the most vital matters this opposition was successful as the government withdrew, after a public inquiry, the most objectionable demands, but the regulations have been so framed as to leave various serious ambiguities, and to re-introduce certain requirements which the manufacturer understood had been withdrawn. Unhappily, the government department maintains a red-tape attitude, so that it is impossible to get the officials to close quarters for an intelligible and workable settlement. At the time of writing, the position is reduced practically to a deadlock.—H. & G.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

NATIONAL ELECTROPLATERS' ASSOCIATION OF THE UNITED STATES AND CANADA.

President, Charles H. Proctor, Arlington, N. J.; Treasurer, H. H. Reama, New York, N. Y.; Corresponding and Financial Secretary, Geo. B. Hogaboom; Recording Secretary, Royal S. Clark. All correspondence should be addressed to the Corresponding Secretary, Geo. B. Hogaboom, 656 Hunterdon St., Newark, N. J. The objects of the Association are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d St., on the fourth Friday of each month, 8 p. m.

The eighteenth regular meeting was called to order at 8.10 p. m., July 22, 1910, by the president, Chas. H. Proctor, with twenty-six members present. A letter was read from the vice-president for Pennsylvania, F. C. Clements of Philadelphia, stating that he hoped to call a meeting of platers in Philadelphia in September. He invited the officers and members of the association to attend, and to speak at the meeting for the good of the cause. A vote of thanks was given to the printing committee for their work on the pamphlets recently issued by the association. The corresponding secretary was given authority to issue a circular letter calling attention to the association.

A discussion on the production of the ormolu gold finish, together with a paper on the Electro-Chemistry of Electroplating by Wm. Voss, also followed by discussion, took up the attention of the association during the period devoted to "good and welfare." The subject for discussion at the meeting to be held Aug. 26 will be Gold Solutions. Wm. Schneider will read a paper on the production of Green Gold Finish. Chas. A. Stiehle upon Roman Gold, J. A. Stremel on Rose Gold, and R. F. Clark on Matt Gold. It is earnestly requested that a large number attend the meeting in order to make the discussion upon the papers as full and extended as possible.

INSTITUTE OF METALS.

President, Sir Gerard Muntz, Bart.; Treasurer, Professor Turner, M. Sc.; Secretary, G. Shaw Scott. All correspondence should be addressed to the Secretary, G. Shaw Scott, M. Sc., Institute of Metals, Caxton House, Westminster, S. W., London, England. The objects of the Institute are for the educational welfare of the metal industry.

The Council of the Institute of Metals announce that they have accepted an invitation from the local members of the Institute to hold the annual autumn meeting in Glasgow. This meeting will take place on Sept. 21 and 22, on which days papers of scientific and practical interest will be read and visits made to plants of metallurgical interest. An influential local committee, of which Professor Archibald Barr is chairman, and Dr. Cecil H. Desch is honorary secretary, has already been formed to carry out the necessary arrangements.

The Council of the Institute have pleasure in announcing that there has been established at the offices of the Institute a pathological museum for specimens of metals and alloys, the first contributions to the museum having been received from the president, Sir Gerard A. Muntz, Bart. This museum, which is the only one of its kind, ought to be of great service to all interested in the metallurgy of the non-ferrous metals, as it is intended that it shall contain specimens showing the various ways in which such metals as copper, brass, aluminum, etc., can fail either as a result of faulty manufacture or of improper usage.

AMERICAN BRASS FOUNDRYMEN'S ASSOCIATION.

President, W. K. B. Patch, Toronto, Canada; Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, 1155 Sycamore street, Buffalo, N. Y. The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities, as invited. The next convention will be held in Pittsburg, Pa., May or June, 1911.

This association has issued its first bulletin, which is dated July, and which gives a list of members who attended at the Detroit meeting in June. The bulletin also gives the names of applicants for membership and concludes with an offer from the secretary, W. M. Corse, to furnish a bound volume of the transactions of the association at a cost of one dollar. This offer is held open until September 1, 1910.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS.

President, Theo. Ahrens, Louisville, Ky.; Commissioner, William M. Webster, Chicago, Ill. All correspondence should be addressed to the Commissioner, William M. Webster, 1112 Schiller Theater Building, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City in December of each year. The Semi-Annual Meeting is generally held at Atlantic City or some other Sea Coast town. The next meeting will be held in Milwaukee, Wis., Sept. 14.

Commissioner Webster reports that the fall meeting of his association will be held at Hotel Pfister, Milwaukee, Wis., Sept. 14. In referring to business conditions, he says: "Business from point of volume is good, but from the standpoint of margins, it is not quite in keeping with the demand, and we would like to see that part stronger and better. We have the hope and belief that still increased demands of early fall will tend to stimulate and better that part.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION.

President, Frederick A. Grier, Cincinnati, Ohio; Acting Treasurer, A. H. Case, Rochester, N. Y.; Secretary, Chas. E. Hildreth, Worcester, Mass. The objects of the Association are to promote the interests of the machine tool builders in the direction of good fellowship and the liberal discussion of subjects relating to the improvement, standardization of parts and methods of manufacturing machine tools. The Association meets at the call of the Executive Committee. Annual meeting held in New York City. Semi-annual meeting selected by the Association. Correspondence should be addressed to the Secretary, Chas. E. Hildreth, Worcester, Mass.

This association has issued the official report of the semi-annual convention which took place at Hotel Seneca, Rochester, N. Y., May 24-25, 1910. The book is a 9½ by 6½-in. volume of 150 pages and gives a full description of the proceedings, including secretary, treasurer and committee reports, papers read by members and the discussions upon same, list of members

and also a memorial upon the death of treasurer W. P. Davis, who died the week following the convention. Mr. Davis was president of W. P. Davis Company, machine tool builders of Rochester, N. Y., and was one of the most enthusiastic workers of the association.

AMERICAN FOUNDRYMEN'S ASSOCIATION.

President, C. J. Speer, Pittsburgh, Pa.; Secretary and Treasurer, Dr. Richard Moldenke, Watchung, N. J. All correspondence should be addressed to the Secretary, Dr. Richard Moldenke, Watchung, N. J. The objects of the Association are for the educational welfare of the iron and metal industry. Annual Convention the latter part of May or early in June each year, in a succession of cities, as invited. The Convention of 1911 will be held in Pittsburgh, Pa., May or June.

Secretary Moldenke reports that he is busily engaged in getting the transactions of the Detroit convention into print. He also says that the members are remitting the annual dues promptly, and from all appearances the raise in dues effected this year, seems to find every one more enthusiastic than ever.

NATIONAL LIGHTING FIXTURE ASSOCIATION.

President, Albert Morrean, Cleveland, O.; Vice-President, A. T. Enos, New York, N. Y.; Treasurer, Ford S. Smith, Detroit, Mich.; Secretary, John F. Byrnes, Chicago, Ill., to whom all correspondence should be addressed. The objects of the association are for the mutual benefit and protection of the members of the gas and electric lighting fixture trade.

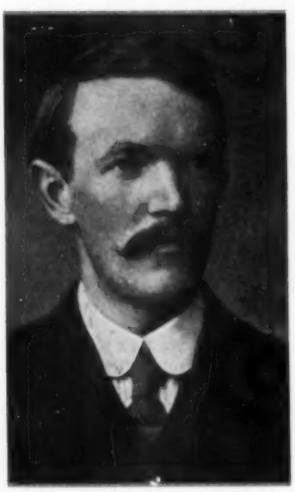
This association was organized in Detroit, Mich., June 6, 1910, by representatives of the gas and electric lighting fixture industry. The executive committee elected at the organization meeting consists of the officers named above, together with the following: E. J. Kulas, of the Tungstolier Co., Cleveland, O., chairman; Jas. Brannen, of the Horn & Brannen Mfg. Co., Philadelphia, Pa.; F. W. Wakefield, of the F. W. Wakefield Brass Co., Vermilion, O.; F. Storsberg, of the F. Storsberg Co., Newark, N. J.; Edward Riddle, of the Western Gas Fixture Co., Toledo, O.; Arthur Polacheck, of Polacheck Bros. & Co., Milwaukee, Wis.; Chas. Ummach, of R. Williamson & Co., Chicago, Ill.

The following firms were represented at the meeting and became therefore charter members of the association: The Enos Co., New York, N. Y., Chas. S. Heffern; The Toledo Chandelier Co., Toledo, O., H. G. Boyers; The Scott-Ullman Co., Cleveland, O., Albert Ullman; The Western Gas Fixture Co., Toledo, O., Edw. N. Riddle; The Detroit Gas and Electric Fixture Co., Detroit, Mich., C. A. Coppock; Owen Walsh Mfg. Co., New York, N. Y., Oscar Malnek; Gas Fixture and Brass Co., Cleveland, O., Mr. Klein; The C. J. Netting Co., Detroit, Mich., C. J. Netting; Detroit Mantel and Tile Co., Detroit, Mich., Mr. François; Detroit Heating and Lighting Co., Detroit, Mich., Mr. McMichaels; Plume & Atwood Mfg. Co., Meriden, Conn., Mr. Wrenn; The American Pin Co., Pittsburg, Pa., Mr. Pratt; The Phoenix Glass Co., Pittsburg, Pa., Mr. Edw. Fox, and The Macbeth-Evans Glass Co., Pittsburg, Pa., Mr. Lissfelt.

The following firms expressed themselves as being heartily in sympathy with the organization: The Dale Co., New York; Cincinnati Artistic Wrought Iron Works, Cincinnati; The Fostoria Glass Specialty Co., Fostoria, Ohio; The Western Gas and Electric Fixture Association, Los Angeles, Cal.; Gill & Co., Philadelphia; Sellner Gas and Electric Fixture Mfg. Co., St. Louis; Chas. Polacheck & Bro. Co., Milwaukee; The Dundee Brass Co., Dundee, N. Y.; The Crown Electric Mfg. Co., St. Charles, Ill.; Euclid Avenue Electric Co., Cleveland; A. J. Cook, Cincinnati; The Faries Mfg. Co., Decatur, Ill.; The Holophane Co., Newark, Ohio; W. C. Vosburgh Mfg. Co., New York; Ideal Gas and Electric Fixture Co., New York; Incandescent Supply Co., New York; The Giese Mfg. Co., Philadelphia; The Simes Co., New York; The Meyberg Co., Los Angeles; The Sechrist Mfg. Co., Denver; Bayonne Gas and Electric Fixture Works, Bayonne, N. J.; Elmer H. Catlin Mfg. Co., Washington, D. C.; R. Williamson & Co., Chicago; Acme Metal Co., Chicago; Tiffany Studies, New York; Horn & Brannen, Philadelphia; L. Plaut & Co., New York; Mitchell-Vance Co., New York; The American Brass and Copper Co., New York.

ITEMS OF INTEREST TO THE INDIVIDUAL.

G. SHAW SCOTT.



G. SHAW SCOTT.

G. Shaw Scott, M.Sc., the permanent secretary of the Institute of Metals, of Sutton, Coldfield, Birmingham, is a native of Walsall, where he was born 25 years ago. After some years at Queen Mary's School, Walsall, he entered the University of Birmingham in 1902, where, first as an undergraduate and subsequently as a graduate, he took an active interest in the affairs of the institution. At the university he held the offices of Chairman of the Metallurgical Society, Chairman of the Engineering Society and President of the Guild of Undergraduates, in addition to various secretaryships. He took his B.Sc. degree, together with the Bowen Research Scholarship in Metallurgy in 1906, and devoted his final year at Birmingham to a research on case-hardening, the results of which, read subsequently before the Iron and Steel Institute, obtained for him in July, 1907, the M.Sc. degree.

DEATH

GEORGE ZUCKER.

GEORGE ZUCKER.

George Zucker, president of the George Zucker Company, manufacturers of "Acme" brand of polishing rouge and compounds, Newark, N. J., died on June 15 at his late residence in East Orange, N. J. at the age of 91 years. He came to this country from Bavaria when 18 years of age. In 1863 he embarked in the business of manufacturing polishing rouge and compositions. He was practically the pioneer in this country of this particular industry. He is survived by his wife, two daughters and four sons, three of whom are actively engaged at the business. These three Zucker brothers have in fact been in entire charge of the business since the elder Zucker's retirement some years ago.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

Additional Trade News will be found under "Correspondence."

The American Bronze Company, Philadelphia, Pa., is receiving bids for an addition 70 by 78 ft.

The Motor Car Specialty Company, Lamberton and Labor streets, Trenton, N. J., manufacturers of automobile accessories, have installed a plating plant.

The new brass and aluminum foundry for the Buick Motor Company, Flint, Mich., now in course of construction, is expected to be completed this summer.

The Ohio Pattern Works, Cincinnati, O., are proposing to build an addition to their brass foundry in the shape of a one-story concrete building 83 x 100 ft.

The new auto parts factory of the Briscoe Manufacturing Company, Detroit, Mich., has been completed, and the machinery is now in the process of installation.

The Crescent Brass Manufacturing Company, Cleveland, Ohio, metal spinners and manufacturers of articles in brass, has succeeded to the business formerly conducted by L. A. Weber & Company.

Ground for the factory for the National Carbon Company at Niagara Falls has been broken. The building will cost about $300,000. About 500 men will be given employment by the company.

The Interior Hotel Manufacturing Company will erect a three-story brick factory at Jamestown, N. Y. Foundations for a five-story structure will be laid so that with the expanding business two more stories can be added.

The Finkel-Hackmeister Company, Pittsburg, Pa., are completing plans for the erection of a new three-story factory building and warehouse on a newly purchased site. This building will, however, not be started before spring.

The Troy Carriage Sunshade Company, Troy, O., have started to erect a new foundry, which will give them additional facilities for taking care of their rapidly increasing business. It is expected that this foundry will be completed some time in October.

The North & Judd Manufacturing Company, New Britain, Conn., has let the contract for two additional structures. The plans call for an addition to the brass foundry, 60 x 105 ft., and an annealing room 70 x 94 ft. Each structure will be of brick and one story high.

The Alliance Brass & Bronze Company, Alliance, O., brass founders, are compelled to enlarge their plant to accommodate their future trade, and owing to their lack of ground at their present place, and the expansion of business, are looking for a site more centrally located.

The Bayless Chemical Laboratory, Muncie, Ind., are specializing on check analysis for brass and aluminum manufacturers and have made specially low prices for this class of work, so that the cost to a manufacturer for a regular daily check on his mixture is but a nominal sum.

On the Niagara County court house at Lockport, N. Y., a gold bronze statue, 12 ft. high and representing Justice, has been placed in position by the John Siddons Company of Rochester. The figure has a huge sword in her right hand and scales in her left. The new figure has no covering over the eyes.

It is reported by the Commercial Club of Corpus Christi, Tex., that their efforts to secure a brass foundry for that city have been successful. A tract of land has been purchased and a proposition has been made to S. J. Stanzel of Temple, Tex., but at present writing Mr. Stanzel has not given the club a definite answer.

The Bunting Brass & Bronze Company, Alliance, O., has completed plans for the erection of a foundry 54 x 250 ft., a machine shop, 54 x 100 ft., and several other buildings to be used for warehouses, pattern vaults, etc. The company has practically decided to locate its plant somewhere further west than Alliance, but the exact location has not been definitely decided upon.

Plans are being prepared for a factory building 100 x 125 ft. by the Imperial Manufacturing Company of Chicago, Ill. This factory will be erected at Center avenue and Harrison street at an estimated cost of $85,000, but the company report in view of the conditions of the building market that they have about decided to delay erection until the early part of next year.

The New England Sherardizing Company, Hartford, Conn., have bought the rights for New England and Boroughs of New York City for the sherardizing process, controlled in this country by the United States Sherardizing Company of New Castle, Pa. They are granting licenses thereon and also putting up plants of their own in New York City, New Haven and Hartford.

The Queen City Brass Works, Denver, Col., report that they will enlarge their plant at once and build a foundry in the rear of their present establishment. A site for the foundry was recently purchased by Richard Kett and Adolph Flucken, the present proprietors. The development of this brass manufacturing industry is due largely to the modernizing of mining and engineering methods.

The new plant at Bridgeport, Pa., which was constructed by the Summerill Tubing Company, manufacturers of seamless tubing, formerly of Philadelphia, is now in full operation, and between 150 to 200 hands are employed. The plant covers two acres of ground, and the buildings are strictly fireproof in every detail of design. The proprietors of this company are F. M. Summerill, Jr., president, and E. V. Gabel, secretary.

The Bronze Metal Company, of New York, are now operating the brass foundries of the Erie Railroad Company at Meadeville, Pa. They have installed a lot of new equipment, including a Berkshire automatic molding machine, complete with patterns and flask, core ovens, etc., which was purchased from W. H. Nicholls, 30 Church street, New York, who handles various kinds of foundry equipment as well as the Berkshire products.

A tract of land comprising approximately five and one-half acres, located on the Chestnut Hill branch of the Pennsylvania Railroad, near the Westmoreland station, Philadelphia, Pa., has been secured by the Tabor Manufacturing Company, engineers and builders of foundry molding machines. The company intend to erect a modern manufacturing plant on this site in which to manufacture their present output. The details of construction are now in the hands of the engineers, and it is expected that operations will be started at an early date.

The new factory of the Millet Brass Company, manufacturers of brass, bronze and aluminum castings, Springfield, Mass., is now in full operation, and the prospects are that within the next few months the number of employees will be about doubled, as the volume of business done has increased so rapidly. The latest

achievement of this company is the manufacture of castings for airships and in this line the company has been unusually successful. The product manufactured by the Millet Brass Company consists of aluminum, brass, bronze compounds, and a market is found for it all over the United States and other countries.

The Acheson Oildag Company, of Niagara Falls, N. Y., has purchased a factory site of thirty acres at Port Huron, Mich., and will erect there their prospective plant. Port Huron was selected as the site because of its comparatively pure water and excellent shipping facilities. On the first of July the Acheson Oildag Company reduced the selling price of Oildag to approximately sixty per cent. of that previously quoted, thereby bringing it down to a price, when bought in quantity, of considerably less per gallon than that of the oil with which it is mixed. The presence of he deflocculated graphite in the oil makes each gallon equal to two to four gallons of plain oil.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., Aug. 30, 1910, and publicly opened immediately thereafter, to furnish at the Navy Yard, Puget Sound, Wash., a quantity of naval supplies, as follows: Sch. 2783; Sal ammoniac—Sch. 2784: Leather, brushes, hardware.—Sch. 2785: Brass and copper pipe and tubing. Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office, Seattle, Wash., or to the Bureau.

T. J. COWIE,
Paymaster-General, U. S. N.

The American Gas Machine Company, Albert Lea, Minn., manufacturers of automatic lighting systems, are erecting a new factory building, five stories in height, 65 x 240 ft. long. The first floor will contain the brass foundry and electroplating department, the second the sheet metal, the third the brass finishing and assembling, while the fourth and fifth are devoted to shipping and stock rooms. The office and salesrooms will be on the first floor. The new plant will be ready for occupancy about Jan. 1, and will accommodate practically double the number of employees at present employed. This company has recently established an eastern branch house in New York for the more efficient handling of its large New England trade.

The International Acheson Graphite Company of Niagara Falls, N. Y., has arranged to erect a very substantial and large addition to its works on the lands of the Niagara Falls Power Company in that City. The addition will be in the nature of a furnace room, which will afford capacity for ten or twelve new furnaces. The additional furnaces will make possible a very large increase in the output of Acheson-Graphite,. These products of this company are electrodes for electro-chemical, metallurgical and electrical purposes, and powdered graphite for dry cell filler, paint pigment, powder glazing, lead pencils, firearms lubrication, general lubrication, electrotypers' moulding and polishing leads, etc.

The current press reports that the Bay State Brass Company, of Haydenville, Mass., was recently the defendant in a replevin suit brought by Max M. Andler, dealer in scrap metals, Boston, Mass. The suit was brought by Andler in order to recover a quantity of brass filings and other material valued at $500, which he claimed the brass company had agreed to return and failed to do so. The representatives of Andler met with no opposition and the metal was obtained and shipped to Boston. The Bay State Brass Company has been reorganized and the new board of directors consists of the following: President, T. C. Bushwell, Troy, N. Y.; treasurer, J. H. B. Willis, New York; Frederick T. Smith, Harry Arnold and General Manager S. Jorgensen.

A large exhibition will be held in the city of Pittsburg, Pa., Oct. 17 to 29, 1910. This show will be held at the Duquesne Gardens, and will be known as the National Land and Irrigation Exposition, and will consist of instructive exhibits of land interests from all parts of the United States. The features of the exposition will include the United States government exhibits, consisting of farm products, grain, fruits, timber, tobacco and also exhibits from industrial concerns of all descriptions. One of the most important exhibits will be from the immigration departments of many of the national railroads, chambers of commerce and commercial clubs from all sections. The opening ceremony will be attended by the governors of the many states represented at the exposition.

The Rutherford Brothers of Muncie, Ind., chandelier manufacturers, have recently put in operation their factory on Broadway in that town. This plant constitutes one of the most thoroughly equipped factories for the manufacture of chandeliers that can be secured, and the daily output is as high as a thousand finished fixtures. The concern manufactures fixtures for gas, electricity or both, and also mission and fancy stand lamps. The plating department of this company was installed under the direction of expert plater T. H. Johnson, who states that the motive power in the factory is electricity, every power-driven machine being run by a separate motor. The plating tanks in the plating department are eleven in number, and range in size from 8 x 4 to 16 x 4 ft., and in addition is equipped with every known appliance incidental to the plating and finishing operations, including sand-blast and spray lacquering machinery.

The Michigan Smelting & Refining Company, Detroit, Mich., are planning to erect a new plant, which will consist of three steel buildings for smelting and refining non-ferrous metals. This plant will occupy a site of five acres of ground recently purchased by the company. Final details are not available at this time, but the plant will be modern in every particular, and will be equipped with every labor-saving device that can be used to advantage. While it is not known at the present time just what form of furnace will be used for melting and refining, the company is experimenting with different makes in order to ascertain which will be best suited to its requirements. The chemical laboratory will be one of the features of the new plant and will be larger and have better facilities than the one now in use at the present plant of the company. Joseph Silliman is the general manager, and Albert J. Hall the metallurgist of the company.

NEW ALUMINUM SOLDERS.

A new aluminum solder has been added to the long list of new aluminum solders, the latest being known as Mendalum, manufactured by the Detroit Aluminum Solder Company, 61 Fort street, East Detroit, Michigan. The manufacturers of this solder claim that they have demonstrated the merits of their product in forty different places, everyone of which acknowledged that they have perfected a satisfactory aluminum solder. They also claim to have done a thing unheard of before, having successfully plugged up old holes and redrilled and retapped them. The manufacturers state that all so-called aluminum solders require scraping, cleaning and filling, but theirs never requires this, therefore saving of at least fifty per cent. in labor.

In the life of THE METAL INDUSTRY we have mentioned many "new aluminum solders" and more during the life of The Aluminum World, the predecessor of THE METAL INDUSTRY. There have been such a number of aluminum solders put on the market that many manufacturers believe there will never be a successful one. The Franklin Institute of Philadelphia thoroughly investigated the subject some twelve years ago and declared there would never be an entirely successful aluminum solder, but said that at that time the most satisfactory was Richard's aluminum solder, and awarded the John Scott medal to the inventor. This solder is now sold by Janney, Steinmetz & Co., Philadelphia, Pa.

Every new solder, however, is worth trying and this new one, entitled "Mendalum," and which has a number of testimonial letters, is surely worth the trial.

REMOVAL

Oscar Boeck, molder of cast aluminum dental plates, Chicago, Ill., announces that he has moved his business to 2233 N. Sawyer avenue, Chicago.

The Hawley Down Draft Furnace Company, manufacturers of the well-known Hawley-Schwartz metal melting furnaces, as well as other kinds of furnaces for the non-ferrous metal trades, have recently moved into the People's Gas Building, at Adams and Michigan avenue, Chicago, and have a magnificent suite of rooms on the ninth floor of this building, occupying the

whole fronting on the ninth floor facing a row of sixteen elevators. The offices are composed of one large general office, five private offices, a large directors' room, and a drafting room 50 x 50 ft., the whole making a specially fine home for this business, in all about 6,000 sq. ft.

FIRES

Fire caused by sparks from a Pennsylvania Railroad engine did about $600 damage to the stock and buildings of E. A. Williams & Sons Brass Works, 109 Plymouth street, Jersey City, N. J., on July 8.

The plants of the Durand Steel Lacquer Company and the Thomas Brass and Iron Company, Waukegan, Illinois, were destroyed by fire on July 26, causing a loss estimated at $350,000.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

ACORN BRASS MANUFACTURING COMPANY, Chicago, Ill. Capital, $2,500. To manufacture brass novelties. Incorporators: James A. Boyd, R. G. Fitz, R. M. Gattshal, all of Chicago.

PEERLESS BRASS MANUFACTURING COMPANY, Cleveland, Ohio. Capital, $20,000. Incorporators: J. F. Jedticker, Carl Jedticker, Anton Jedticker, P. J. Brady and J. J. Gaughan, all of Cleveland.

MCVITTIE PLATING COMPANY, Chicago, Ill. Capital, $10,000. Manufacturing and plating. Incorporators: James McVittie, Arthur B. Irwin, John E. Allison and Albert McVittie, all of Chicago.

A. J. GORMAN COMPANY, Philadelphia, Pa. Capital stock, $25,000. To manufacture silverware, trade in jewelry and metal products generally. President, Joseph Kaufman. Other incorporators not named in final decree.

HIGH-GRADE FOUNDRIES COMPANY, Borough of Queens, N. Y. Capital, $50,000 To manufacture brass, iron, steel castings, etc. Incorporators: Jessie L. Snyder, Charles E. McMahon and David F. Price, all of 1 Liberty street, New York.

THE GRAFTON MANUFACTURING COMPANY, Martin's Ferry, O. Capital stock, $15,000. To manufacture babbitt metal, etc. Incorporators: W. S. Grafton, F. H. Grafton, P. Dougherty, I. F. Bates and Matt McDermott, all of Martin's Ferry.

THE NEW ENGLAND SHERARDIZING COMPANY, Hartford, Conn. Capital, $80,000. To sherardize, manufacture, buy and sell copper, brass, iron and steel. Incorporators: Judson H. Root, J. McA. Johnson, John F. Howard and I. K. Hamilton, Jr., all of Hartford.

C. R. SMITH & SON, INCORPORATED, Philadelphia, Pa. Capital stock not set forth in preliminary application. To manufacture silverware, watches and jewelry and to deal in all manner of metal products and articles of art. Incorporators: Annie K. C. Smith, George W. Martin, and J. Bruce Byall, all of Philadelphia.

INCREASE OF CAPITAL STOCK

The Williamsburg Brass Foundry, of Brooklyn, N. Y., has certified to the Secretary of State that the amount of its capital stock has been increased from $7,000 to $15,000, consisting of shares of $50 each. Its directors include Samuel Cutler, Philip Cutler, Marcus Rudnick, Nathan Rothstein and John McLoughlin.

PRINTED MATTER

BEARING METAL.—The melting of bearing metal by electricity is very concisely described on a card recently issued by the Frictionless Metal Company, Chattanooga, Tenn.

FLUXES.—A small folder is issued by C. M. Miller, giving a description of Radioclarite, which is a flux for general cleaning, strengthening and metal saving in the melting of brass, copper, lead, zinc, aluminum, etc. Radioclarite is sold by the Basic Mineral Company, North Side, Pittsburg, Pa.

BEARINGS.—The Lumen Bearing Company, brass founders of Buffalo and Toronto, publish a dissertation on the ideal gasoline engine bearings which they manufacture under the name of No. 14 alloy, and which they claim is a copper-tin-phosphor bronze purely scientific in composition, and specially designed to meet all possible requirements.

ROLLING MILL.—The Crown Dental Rolling Mill, manufactured by the W. W. Oliver Manufacturing Company, Buffalo, N. Y., is described in their bulletin No. 10, issued for July. This rolling mill, while designed primarily to meet the requirements of the dental profession, is adapted, according to the claims made for it by the company, for use of the jeweler and assayer.

FURNACES: The W. S. Rockwell Furnace Company, 50 Church street, New York furnace engineers, have issued a small catalogue of the Rockwell Spring Fitting Furnace. These furnaces are specially designed for heating steel uniformly and cleanly, and it is claimed that there is no excuse for a spring to be either over or under heated when treated in the furnace. These furnaces are run by oil or gas fuel and further information can be had upon request.

BEARING METALS.—The Chicago Bearing Metal Company, Chicago, Ill., gives some interesting information regarding their Graphose Bronze, a bearing metal which they claim is one of the best anti-friction metals made. This material the company likens to a mixture of milk and cod liver oil in that they term their alloy an "emulsion of lead in a copper and tin matrix." This company also manufacture graphose white brass, phosphor bronze, manganese bronze, babbitt metals, solder and acid resisting metals, all of which are described in a small publication issued occasionally by them, and called the Graphic Age.

FURNACES AND FORGES.—The Walter MacLeod Company, Cincinnati, O., have issued a large folder catalogue giving descriptions of the long line of foundry and railroad appliances manufactured by them. These products go under the name of the Buckeye, and include brazing and welding tanks for lead and babbit metals, melting furnaces, heaters for skin drying molds and cores, carbide lights for searchlights, tire heaters, furnaces and forges for annealing as well as melting metals of every description, and also sand-blast. Copies of this interesting catalogue may be obtained upon application.

CATALOGUE EXHIBIT

An exhibition of every kind of catalogue may be seen at THE METAL INDUSTRY office, 99 John street, New York. THE METAL INDUSTRY is prepared to do all of the work necessary for the making of catalogues, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

AD NEWS

The Eureka Pneumatic Spray Company announce in this issue that they are prepared to furnish superior spraying lacquer enamels, white, transparent and in colors, to any of their customers who are using Eureka Pneumatic Spray apparatus. The address of the company is 276 Spring street, New York.

The Detroit Aluminum Solder Company, Detroit, Mich., are introducing a new aluminum solder which they state works very satisfactorily on aluminum in any form from 1/1200 of an inch thick up to any thickness. Half-pound samples of this solder may be obtained from the company at one dollar each. The company submits a letter from W. J. Keep, superintendent of The Michigan Stove Company, Detroit, Mich., who states that he has satisfied himself, by personal tests, that Mendalum is all that its owners claim for it, viz., a perfectly satisfactory aluminum solder, and congratulates the company and the aluminum industry, in general, upon the discovery.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

	August 8, 1910 Pounds.
Stocks of marketable copper of all kinds on hand at all points in the United States, July 1, 1910.....	168,386,017
Production of marketable copper in the United States from all domestic and foreign sources during July, 1910	118,370,003
	286,756,020
Deliveries:	
For domestic consumption..... 56,708,175	
For export 59,407,167	
	116,115.342
Stocks of marketable copper of all kinds on hand at all points in the United States, August 1, 1910..	170,640,678
Stocks increased during the month of July.....	2,254,661

METAL MARKET REVIEW

NEW YORK, Aug. 8, 1910.

COPPER.—The London quotations for standard copper show a net decline for the month of 7s. 6d. Opening at £54 17s. 6d. prices gradually declined to £52 15s., later advanced to £55 10s. and closed at £54 10s. The trading has been dull except towards the close when a new speculative movement was started on the strength of the reported agreement to restrict production.

In the New York market consumers both here and abroad have placed considerable orders, the market for a few days was fairly active and prices were pegged up accordingly, at the close, however, the buying has sagged off and consumers generally do not seem to take very much stock in the reported "gentlemen's agreement" to restrict production. Prices today are possibly about 10 points higher than a month ago, at the same time it is to be noted that prices are nearly half a cent a pound higher than the low prices ruling earlier in the month, so that the much advertised restriction talk has had the effect of stopping a decline and has lifted the market as already stated half a cent a pound.

What this "gentlemen's agreement" is going to amount to remains to be seen. There is plenty of good money in copper at around 12½ cents per pound and any advance much over this figure will bring in foreign copper, and no copper companies in this country are going to hold back supplies as long as they can make money out of copper at 12½ cents.

The exports for the month were fairly heavy, considering the fact that the price of copper abroad was below our market the exports of 22,875 tons can hardly be for account of consumers and the inference is the stock is being carried abroad for speculative account. Lake copper today is quotable at 12⅞ cents per pound against 12¾ a month ago; electrolytic 12⅝ today against 12½ and casting at 12½ cents against 12.40 at the close of July.

TIN.—The price of tin in London shows a net decline for the month of about 30s. per ton. Opened at £150 15s., declined to £147 15s., the lowest point, and closed at £149 5s.

In the New York market there has been a fair demand, and towards the close of the month there was a shortage of spot tin and prices were run up one half a cent per pound for July delivery over early arrivals in August. The market today is firmer and prices are fully ¾ of a cent above those ruling a month ago.

Deliveries into consumption were fairly heavy, 3,800 tons, making the total deliveries so far this year 3,900 tons heavier than the same period last year. The total visible supply at the end of July shows an increase of nearly 2,000 tons over last month.

The market today is steady at around 33½ cents per pound for spot and 10 to 15 points lower for futures.

LEAD.—The foreign lead market stays around £12 10s., £12 12s. 6d.

In the New York market lead has ruled fairly steady, the Trust price, 50-ton lots New York delivery, is 4.40, while for carload lots the price is about 5 points higher. In East St. Louis the market is firm at around 4.30.

SPELTER.—Foreign spelter is quotable around £12 12s. 6d. to £12 5s.

Spot spelter in New York continues to bring a premium over shipment, but the market generally is easier than a month ago. Prompt Western shipment is obtainable at 5.15 to 5.20, New York delivery. In East St. Louis the market is dull at around 5 cents.

ALUMINUM.—The foreign aluminum has been offered freely at around 22 to 22¼ cents, according to delivery and quantity, smaller lots are quotable at 23 to 24 cents.

ANTIMONY.—There is no change to note in this metal, Cookson's is obtainable at 8.15, Hallett's at 7.85, Chinese at 7.35, Hungarian grade 7.25.

SILVER.—London silver has fluctuated during July as follows: Opened at 24⅝, 25⅝ highest, 24½ lowest, closing at 24⅝d. per oz.

In New York the market has ranged between 53 cents lowest to 53⅜ highest and closes at 53¼ cents.

QUICKSILVER.—There has been no change; wholesale lots $47 per flask, $48 to $48.50 for jobbing lots.

PLATINUM.—Holds very firm at $36 per ounce for hard and $34 for commercial. Scrap platinum is worth about $29 to $29.50 per ounce.

SHEET METALS.—Prices are unchanged; copper wire 13 cents base, sheet copper 18 cents, seamless brass tubing 18 cents, copper tubing 22 cents and sheet brass 14 cents.

OLD METALS.—The old metal market has been rather more active, and there has been a good export demand. Prices are about the same as a month ago. Consumers are ready to take hold at around present prices and the outlook is better for a good demand later on.—J. J. A.

THE JULY MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	12.85	12.50	12.60
Electrolytic	12.70	12.25	12.40
Casting	12.60	12.20	12.35
TIN	33.50	32.50	33.00
LEAD	4.45	4.40	4.45
SPELTER	5.40	5.35	5.40
ANTIMONY (Hallett's)	8.10	8.00	8.05
SILVER	.53⅜	.53	53.15

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.

1909.—Average for year, 13.416. 1910.—Jan. 13⅞. Feb. 13⅞. March 13¾. April 13¼. May 13. June 12¾. July 12¾.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Metal Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INFORMATION BUREAU

Any firm intending to buy metals machinery or supplies and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds. Address THE METAL INDUSTRY, 99 John street, New York.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the back advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds. See Want Ad. pages.

Metal Prices, August 8, 1910

NEW METALS.

	Price per lb. Cents.
Copper—Pig, Bar and Ingot and Old Copper. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	12.85
Electrolytic, carload lots	12.75
Casting, carload lots	12.50
Tin—Duty Free.	
Straits of Malacca, carload lots	33.50
Lead—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.45
Spelter—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western carload lots	5.15
Aluminum—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	28.00
100 lbs. lots	25.00
Ton lots	22.50
Antimony—Duty 1½c. per lb.	
Cookson's, cask lots, nominal	8.15
Hallett's, cask lots	7.85
Other cask lots	7.25
Nickel—Duty Ingot, 6c. per lb. Sheet, strips and wire 35% ad valorem.	
Shot, Plaquettes, Ingots, Blocks, according to quantity	.45 to .60
Manganese Metal—Duty 20%	.80
Magnesium Metal—Duty 3 cents per pound and 25% ad valorem	$1.50
Bismuth—Duty free	2.00
Cadmium—Duty free	.75
	Price per oz.
Gold—Duty free	$20.67
Silver—Duty free	.53¼
Platinum—Duty free	33.25
Quicksilver—Duty 7c. per lb. Price per pound	.65c. to 67c.

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
11.00 to 11.25	Heavy Cut Copper	12.00 to 12.25
10.50 to 10.75	Copper Wire	11.50 to 11.75
9.50 to 9.75	Light Copper	10.50 to 10.75
10.00 to 10.25	Heavy Mach. Comp.	11.00 to 11.25
7.50 to 7.75	Heavy Brass	8.50 to 8.75
5.50 to 5.75	Light Brass	6.50 to 6.75
7.00 to 7.25	No. 1 Yellow Brass Turnings	8.00 to 8.25
8.25 to 9.00	No. 1 Comp. Turnings	9.75 to 10.00
3.90 to 4.00	Heavy Lead	—— to 4.25
3.75 to 3.90	Zinc Scrap	—— to 4.25
5.00 to 5.50	Scrap Aluminum, turnings	5.00 to 5.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 18.00
19.50 to 20.00	No. 1 Pewter	23.00 to 24.00
25.00 to 27.00	Old Nickel	28.00 to 30.00

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% to 20% ....according to quantity	28 to 35
Silicon Copper, 30% guaranteed. " "	38
Phosphor Copper, 5% " "	19 to 21
Phosphor Copper 10% to 15%, guaranteed " "	28 to 30
Manganese Copper, 30% " "	30 to 35
Phosphor Tin " "	34 to 36
Brass Ingot, Yellow " "	9 to 10
Brass Ingot, Red " "	11 to 12½
Bronze Ingot " "	10 to 11
Manganese Bronze " "	17 to 19
Phosphor Bronze " "	13 to 16
Casting Aluminum Alloys " "	29 to 35

Phosphorus—Duty 18c. per lb.
According to quantity ..... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 18 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7¾ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7¾ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Coppers								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from. 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over ..... **Base Price.**

(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

	Cents per lb.
ZINC—Duty, sheet, 1¾c. per lb.	
Carload lots, standard sizes and gauges, at mill	7.50 less 8%
Casks	8.00
Open casks	8.50

Metal Prices, August 8, 1910

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect June 27, 1910, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.13¼	$0.14⅝	$0.16⅝
Wire	.13¼	.15½	.17
Rod	.13¼	.15½	.18
Brazed tubing	.18⅝	—	.20½
Open seam tubing	.16⅝	—	.18½
Angles and channels, plain	.16⅝	—	.18½

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 7.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass...	½c.	per	lb.	net	advance
" —Best spring, drawing and spinning brass....	1½c.	"	"	"	"
Wire —Extra spring and brazing wire.....	½c.	"	"	"	"
" —Best spring and brazing wire.....	1c.	"	"	"	"

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.14¼	$0.15⅝	$0.17⅝
Wire	.14½	.16½	.18
Rod	.14½	.16½	.19
Brazed tubing	.19⅝	—	.21½
Open seam tubing	.17⅝	—	.19½
Angles and channels, plain	.17⅝	—	.19½

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 7.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass...	½c.	per	lb.	net	advance
" —Best spring, drawing and spinning brass....	1½c.	"	"	"	"
Wire —Extra spring and brazing wire.....	½c.	"	"	"	"
" —Best spring and brazing wire.....	1c.	"	"	"	"

BARE COPPER WIRE—CARLOAD LOTS.

14c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	18½c.	per	lb. base.
100 lbs. to 300 lbs. in one order	19c.	"	"
Less than 100 lbs. in one order	20½c.	"	"

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 22c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet— Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1½ inch	25	27
1¾ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 55 and 5%.

PRICES FOR MUNTZ'S METAL AND TOBIN BRONZE.

Muntz's or Yellow Metal Sheathing (14" x 48")	14½c.	net base
" " " Rectangular sheets other than Sheathing	16½c.	" "
" " " Rod	14½c.	" "
Tobin Bronze Rod	16c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bars in the rough, 22¼c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than.....	31in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including.....	12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
		in coils.								
No. 13 and heavier		34	34	36	36	36	36	39	39	39
" 14		34	34	36	36	36	36	39	39	39
" 15		34	34	36	36	36	36	39	39	39
" 16		34	34	36	36	36	36	39	39	39
" 17		34	34	36	36	36	36	39	39	39
" 18		34	34	36	36	36	36	39	39	42
" 19		34	34	36	36	36	36	39	40	43
" 20		34	36	36	36	36	38	41	42	44
" 21		34	38	38	38	38	40	43	44	50
" 22		34	38	38	38	40	40	43	47	51
" 23		34	38	38	38	40	40	43	49	52
" 24		34	38	40	42	42	42	45	51	54
" 25		36	39	41	43	43	43	46	53	57
" 26		36	39	42	46	46	46	51	55	61
" 27		36	40	44	48	48	49	54	58	64
" 28		36	40	46	48	49	49	56	62	67
" 29		38	41	48	50	52	52	61	67	72
" 30		38	42	50	52	56	62	69	72	77
" 31		43	47	55	58	63	71	74	77	83
" 32		45	49	57	61	69	77	91	90	95
" 33		47	51	60	65	73	84	91	100	110
" 34		50	55	62	70	78	91	108	110	120
" 35		..	65	70	80	90	100	115	125	..
" 36		..	80	90	100	115	120	135	..	..
" 37		..	104	114	129	144	159	174	..	..
" 38		..	124	139	154	169	184	204	..	..
" 39		..	144	164	184	204	224	..	..	..
" 40		..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.100.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	57
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	68	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

200 lbs. to 30,000 lbs., 3 cents off list; 30,000 lbs. and over, 4 cents off list.

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4	per cent.	to No.	19, B. & S. Gauge, inclusive		$0.60
6	"	"	19, " " "		.70
9	"	"	19, " " "		.85
12	"	"	19, " " "		1.00
15	"	"	19, " " "		1.15
16	"	"	19, " " "		1.20
18	"	"	19, " " "		1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICE OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.

ALUMINUM COMPANY OF AMERICA

PITTSBURGH, PA.

ALUMINUM

SHEET TUBING
EXTRUDED SHAPES
ROD RIVETS WIRE
ELECTRICAL CONDUCTORS

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NEW YORK—99 John St.
PHILADELPHIA—320 Witherspoon Bldg.
BOSTON—131 State St.
ROCHESTER—406 Powers Block
CHICAGO—Old Colony Bldg.
CLEVELAND—719 Garfield Bldg.
PITTSBURGH—2344 Oliver Bldg.
WASHINGTON—514 Nat. Met. Bk. Bldg.
DETROIT—1515 Ford Bldg.

DIRECTORY

METAL ROLLING MILLS.

INGOT, PLATE, SHEET, ROD, WIRE, TUBE, METAL GOODS.

HENDRICKS BROTHERS
Manufacturers of
Sheet and Bar Copper
COPPER FIREBOX PLATES
and STAYBOLTS
WIRE and BRAZIER'S RIVETS
IMPORTERS AND DEALERS IN
INGOT COPPER, BLOCK TIN,
SPELTER, LEAD, ANTIMONY
BISMUTH, NICKEL, Etc.
49 Cliff Street, NEW YORK

Established 1802 Cable Address: "Scovill"
SCOVILL MFG. CO.
WATERBURY, CONN.
THE LARGEST AND MOST FULLY EQUIPPED BRASS ROLLING MILLS AND METAL GOODS MANUFACTURING ESTABLISHMENT IN THE WORLD
Estimates for Specialties in Brass, German Silver and Aluminum furnished on application. DEPOTS:
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General Offices, Mills and Factories.
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NEW YORK OFFICE, 99 JOHN STREET.
Providence (R. I.) Store, 131 Dorrance St.
Shipments Upon Receipt of Order From Large Stock of
SEAMLESS DRAWN BRASS AND COPPER TUBING
BRASS { SHEET ROD WIRE
COPPER { SHEET ROD WIRE
GERMAN SILVER { SHEET ROD WIRE
AT WATERBURY

Non-Corrosive Finest Quality
COPPER AND YELLOW
(Muntz) Metal
Naval Brass
Naval Bronze
Manganese Bronze
Plates, Sheets, Bolts, Bars, Rods, Nails, Tacks, &c.
Taunton-New Bedford Copper Co.
NEW BEDFORD, MASS.
71 Water St., New York 61 Batterymarch St., Boston

C. G. HUSSEY & CO.
PITTSBURGH, PENNA.
Manufacturers of
COPPER
In Sheets, Plates, Rolls
ANODES
Tacks and Nails

Metal Goods Made To Order
from
BRASS and COPPER
Sheets, Rods, Wire and Tubing
Manganese
Aluminum
Phosphor
Silicon and "Bridgeport" BRONZE
BRIDGEPORT BRASS CO.
Manufacturers
BRIDGEPORT, CONN.

BRASS and COPPER in Sheets and Rolls
SILVER PLATED METAL (for Coach Lamps)
BRITANNIA METAL
B. & M. BABBITT METAL for Bearings
LINING METAL for Automobile Bearings and Copper for Electrical Purposes
H. K. & F. S. BENSON
GLEN RIDGE, N. J.

THE SEYMOUR MFG. CO.
SEYMOUR, CONN.
German Silver
BRASS, COPPER and BRONZE IN SHEETS, WIRE, RODS and TUBES
COPPER AND NICKEL ANODES
Resistance Wires, Wire, Shot Copper

A. H. Wells & Co.
WATERBURY, CONN.
MANUFACTURERS OF
SEAMLESS..... NICKEL SILVER, BRASS, COPPER, BRONZE AND PURE COPPER **TUBING**
TUBING FOR ELECTRICAL PURPOSES
Odd and Special Shapes, and Small Tubing, a Specialty
—ALSO THE—
Bourdon Steam Gauge Springs
All sizes from 8 to 36, B. & S. Gauge.

The Ansonia Brass and Copper Co.
99 JOHN ST., NEW YORK
MANUFACTURERS OF
BRASS and COPPER Sheets, Tubes, Rods and Wire
SOLE MANUFACTURERS TOBIN BRONZE
(Trade-Mark Registered)

PHENIX TUBE CO.
Manufacturers of
Brass and Bronze Iron Lined Tubes
Brazed Steel Tubes,
Round and Square.
Main Office and Mills: Brooklyn, N. Y. City Branch Offices: Chicago, San Francisco

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FOR SALE
SEND FOR RATES

"RIVERSIDE" German Silver
Phosphor Bronze
Sheets, Rods, Wire, Ingots, Castings, Jewelers' Bars and Alloys
The Riverside Metal Co.
Riverside, Burlington Co., N. J.

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METAL ROLLING MILLS.

INGOT, PLATE, SHEET, ROD, WIRE, TUBE, METAL GOODS.

SEAMLESS STEEL TUBING
From 4 in. Diameter to 1-64 in.
Finished Bright, Smooth and Accurate to 1-1000 In. Inside and Out
Tool Steel Tubing. Soft Steel Tubing. Also Small Brass, Copper and Aluminum Tubing.
ELLWOOD IVINS TUBE WORKS
Oak Lane Station, Philadelphia, Pa.

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Rollers of Silver Anodes and Sterling Silver
ALSO DEALERS IN
FINE GOLD AND SILVER
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Long Distance Phone 3759 R.

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95 PINE STREET PROVIDENCE, R. I.
MANUFACTURERS OF
SEAMLESS BRASS . . **TUBING**
In Small Sizes
GOLD SOLDER, sheet or wire.
SILVER SOLDER, sheet or wire.
SHEET BRASS SOLDER

ROLLED FIRELESS STERLING SILVER
SILVER SOLDERS, ANODE SILVER and SILVER WIRE
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Manufacturers of
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SHEET BLOCK TIN
CASTING, ROLLING AND REFINING.
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STANDARD ROLLING MILLS
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MANUFACTURERS OF PLATED SHEET METALS
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Manufacturers of
PLATED SHEET METALS
FANCY ROLLED METALS
Nickelzinc, Brasszinc, Copperzinc, Bronzezinc, Nickeltin, Brasstin, Coppertin, Bronzetin Sheet Zinc, polished and unpolished, for stamping.
Large Saving to Manufacturers Last Year's Sales 1,000,000 lbs.
For Further Information Address Office: PERU, ILLINOIS

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BUCKLE TONGUES
made from any metal desired.
English style. The finest made.
THE CAMPBELL-WARNER CO., Middletown, Conn.

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LA SALLE, ILLINOIS
Smelters of Spelter
and Manufacturers of
Sheet Zinc and Sulphuric Acid
Zincs for Leclanche Battery
Special Sizes of Zinc to order. Rolled Battery Plates. Selected Plates for Etchers' and Lithographers' use. Selected Sheets for Paper and Card Makers' use. Stove and Washboard Blanks.

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The Original Brand of Pure Spelter
Indispensable in the manufacture of
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High Grade Spelter
GOLDEN ROD BRAND
Suitable for High Grade Brass Work, Cartridge Metal, Etc.
ALUMINUM ALLOYS, Etc.
Brazing Solder
H. M. Shimer & Co.
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Manufacturers of
HIGH GRADE
SPELTER
SUITABLE FOR ALL PURPOSES
General Offices:
120 N. Peoria Street, Chicago, Ills.
Works: Sandoval, Ills.

Cold Rolled Zinc
IN COILS FOR
Drawing and Stamping
THE PLATT BROS & CO.
WATERBURY, CT.

THIS SPACE FOR SALE

High-Grade Spelter and Sulphuric Acid
HEGELER BROTHERS, DANVILLE, ILL.

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122 N. Peoria Street, Chicago, Ill. Cable Address "Smelref," Chicago
Manufacturers of
Pig and Bar Lead, Spelter, Babbitt Metals
Linotype, Stereotype, Monotype and Electrotype Metal, Yellow Composition and Phosphor Ingots
Dealers in New and Old Metals, and the Largest Buyers of Zinc Dross, Skimmings, Sal Skimmings, Scrap Zinc and Aluminum

THE MORTON B. SMITH CO.
241 and 243 Front St., New York
Offer for Sale:
HEAVY COPPER AND WIRE
Ready for the Crucible
COMPOSITION
Carefully Selected
HEAVY YELLOW BRASS
Free from Iron
OLD METALS GENERALLY

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THEODORE HOFELLER & CO.
BUFFALO, N. Y.
Our Specialties
Heavy Copper and Copper Wire Cut in Crucible Shape.
Number One Red Brass Scrap.
Heavy Yellow Brass Scrap.

The CRESCENT
Phosphorized Metal Co.
PHILADELPHIA, PA.
Manufacturers of High Grade PHOSPHOR TIN, PHOSPHOR BRONZE, PHOSPHOR COPPER, Containing up to 15% Phosphorus. MANGANESE COPPER.
Also Dealers in PHOSPHORUS. Lowest Market Prices.

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734-740 EAST 14th STREET, NEW YORK CITY
Manufacturers of
Solder, Type Metals, Babbitt Metals and White Metal Alloys
Smelters of Drosses of All Kinds — Dealers in New and Old Metals

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SMELTERS OF
Skimmings, Grindings, Buffings, Sweepings — **BRASS** — Skimmings, Grindings, Buffings, Sweepings
WHITE & BRO., Inc.
Station K, Philadelphia, Pa.

ALBERT A. MOERS 24 Stone Street NEW YORK
PIG TIN
Write me to-day for attractive prices in large and small quantities. Only 98 per cent. and 99 per cent. handled. Can be used for all purposes. 250 tons per month.

MAGNESIUM METAL
Improves the Strength of
Copper, Brass, Bronze, Aluminum, Nickel, Zinc Mixtures
NOTE: Always Specify "LEAVITT'S" BRAND
C. W. LEAVITT & CO.
1810 CORTLANDT BLDG. NEW YORK

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Send for Rates

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Send for Rates

S. BIRKENSTEIN & SONS
379-407 W. ONTARIO STREET, CHICAGO, ILL.
INGOT ALUMINUM and ALLOYS

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BUYERS AND SELLERS OF NEW AND OLD METALS.

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EAST ST. LOUIS, ILLS.

Manufacturers of Soldering Flux, Commercial Salts, and Chloride of Zinc in Fused, Granulated and Liquid form.

The Granulated Chloride of Zinc is indispensable, as a flux, to Brass, Copper and Aluminum Founders.

Put up in 50 and 100 lbs. iron packages.

Price 10 cents per pound delivered in the United States.

Wm. F. Renziehausen Co.

GOLD AND SILVER REFINERS

SWEEP SMELTERS, ASSAYERS AND ANALYTICAL CHEMISTS

Full value paid for any material containing Gold, Silver and Platinum

43-47 Oliver St., NEWARK, N. J.

LONG DISTANCE PHONE, 3759-R

M. M. ANDLER & CO.

BOSTON, MASS.

Dealers in **METALS**

Consumers of Skimmings, Grindings, Drosses, Filings and all kinds of Scrap Metals. Also Brass Foundry Ashes.

METALLIC PHOSPHORO

(Phosphor Tin Improved)

Prevents the formation of Pores, Blow-holes or Cold-shuts in Castings.

Also prevents excessive shrinkage.

THE NEW ERA MANUFACTURING CO.

KALAMAZOO, MICH.

BRASS INGOT

WHIPPLE & CHOATE, BRIDGEPORT, CONN.

For Advertisement of

U. S. REDUCTION CO.

See Page 49

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DIRECTORY

METAL FOUNDERS, FINISHERS AND SHEET METAL WORKERS.

THE LIGHT MANUFACTURING & FOUNDRY COMPANY

POTTSTOWN, PA.

ARE THE ORIGINAL AND ONLY MANUFACTURERS OF

AUTOMOBILE BRAND **AERIAL** BRAND

ALUMINUM CASTINGS

Our Aluminum Castings are especially adapted to Automobile, Auto Boat and Aerial Construction.

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UNIVERSAL POLISHING WHEEL

Universal by name, and in fact. The newest and positively the best wheel made. Pronounced so by experts. Ask them.

It is practically universal due to the almost unlimited range of work which it is capable of doing.

Used for Roughing, Fining or Greasing.

Replaces Felt, Bullneck and Canvas wheels.

It is economical, resilient and will not burn the surface of the metal.

Unequalled for nearly all lines of work.

Write for Bulletin No. 120

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ESTABLISHED 1820

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79 Walker Street, NEW YORK
108-110 N. Clinton Street, CHICAGO, ILL.

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MANUFACTURER OF

Brass and Nickel Platers' Supplies

40 and 42 WITHERS STREET
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WRITE FOR PRICES

WESTERN AGENCY 20 No. Desplaines Street, CHICAGO

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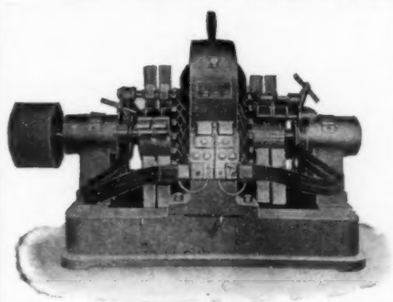

For Electroplating, Electrotyping and Electro-Galvanizing in single, two and three voltages

60 to 10000 Amperes, 3 to 30 Volts

Shunt, compound and separately excited

Write for Catalogue

CHAS. J. BOGUE ELECTRIC CO.
513-515 West 29th Street
NEW YORK

Cable Address "MACHELECT" 'Phone, 581 Chelsea

TO CONTROL

the deposit of metal in a plating bath absolutely, without watching an ammeter or clock, you should use

The Sangamo Ampere-Hour Meter

Dial calibrated to read direct in weights of any metal.

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SANGAMO ELECTRIC COMPANY, Springfield, Illinois

ELECTRO-PLATERS' SUPPLIES AND POLISHING MATERIALS

NICKEL ANODES

NICKEL SALTS

PLATING DYNAMOS

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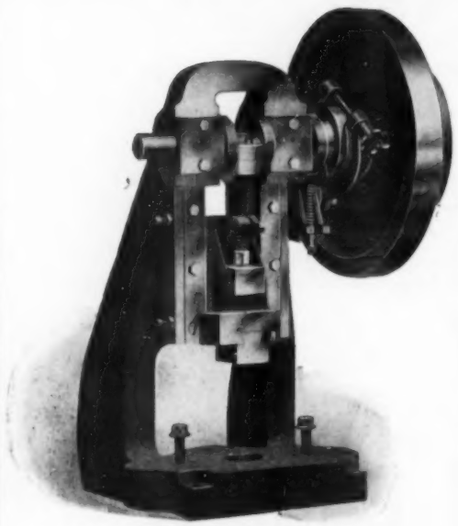

No. 100 Bench Press (3911)

These presses are designed to use for work the nature of which necessitates stopping the machine between strokes to handle the product. Other small bench presses for continuous running are described in Catalogue M.

The accompanying illustration shows the Standard Press arranged for mounting on the bench. It is our intention to keep these presses on hand at all times ready for prompt shipment. The bottom of the gate is arranged with a punch holder for receiving the punch. This punch holder is left blank, unless the customer specifies with his order that he wishes a hole put in it, and gives the dimensions for the hole. The bed of the press is provided with die bed bolts and die bed bolt holes as given in the specifications. A hole is also tapped in the bed immediately back of the center of the press for the purpose of attaching a stripper post or other device.

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Waterbury, Connecticut, U. S. A.

Cleveland Office: 1012 Williamson Building — Philadelphia Office: Real Estate Trust Building

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The harvest you are looking for, working for, and hoping for, is that of dollars.

Not to look at nor to hoard, but for the glorious privilege of being independent—here are "helps."

If you are "cutting down" brass, bronze, brittania or any other metal casting, Stevens' TRIPOLI COMPOSITION helps the dollar harvest. It "gets there" quicker, better, and with less quantity used than anything else.

If you are "coloring up" brass castings, Stevens' WHITE COLUMBIA COLORING makes a similar record.

If you are buffing stove nickel plates, panels, range skirts with deep backgrounds, and have not tried Stevens' SILVER FINISH, you have missed an opportunity.

If you want to produce the dark blue finish, "UNION MAID WHITE POLISH" is the one thing needful.

You see, I make compositions for specific purposes; state your case and I have the prescription.

The plan applies to FOUNDRY FACINGS and FOUNDRY SUPPLIES, all of which I manufacture.

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